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LET'S GO

It is but a matter of days before the vacation days are ended. Teachers and students will soon hie back to the classroom each to their several duties.

There is still time for the teacher to make changes and adjustments in his plans for the new year. These plans must be carefully considered because on them hinge the success of the year's work.

Now is the time to do this planning, because the harassing pressure of daily duties is not yet upon us. There is a great deal of meaning to the slang phrase "Let's go." The spirit of this expression ought to animate us as we go about preparing for the opening of school.

This Month's Cover

The picture on the cover of the September issue of the INDUSTRIAL-ARTS MAGAZINE is a replica of a mural painting entitled "Achievement is the Summit after the Climb." This painting was made by F. Luis Mora, N.A., and was presented to the Boys' Club of Pittsfield, Mass., by Z. Marshall Crane.

Photo by courtesy of Grand Central Art Galleries, New York City.

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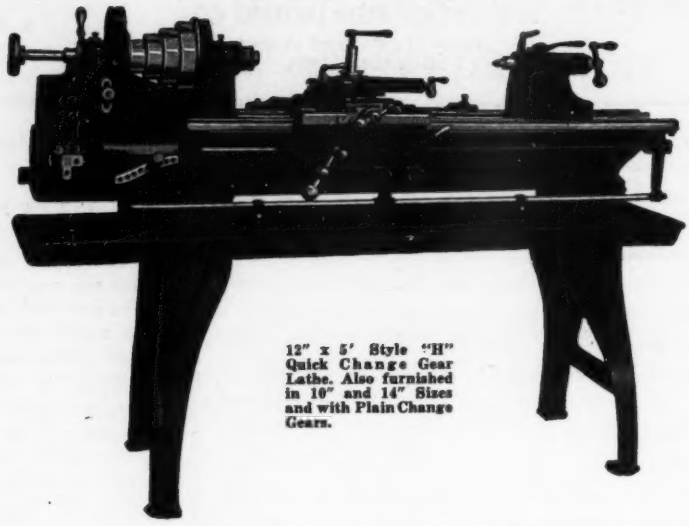

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THE INDUSTRIAL ARTS MAGAZINE

Volume XVII SEPTEMBER, 1928 No. 9

TEACHING RELATED WORK IN VOCATIONAL AND PART-TIME CLASSES

M. W. Muldoon, Waverly, N. Y.

III. LESSON PLANNING FOR INDIVIDUAL WORK[1]

BECAUSE of the lack of homogeneity in the average part-time class, much individual instruction is necessary. Where there are a dozen boys from the machine trades, two or three electrician's apprentices, and a junior clerk or so in the same related-work section, or boys from the sixth grade and first-year high school reciting in the same division, the individual instruction sheet is probably the only solution. The term, as used here, means a formally organized lesson sheet, usually typed or mimeographed, through which the student, by following out its directions, gains new knowledge with a minimum amount of aid from the teacher. A "drill sheet" gives him material for further practice in applying some principle which he already knows. An "individual instruction sheet" leads him to discover new principles for himself. Such an instruction sheet is practically an operation sheet for the classroom.

While it is almost indispensable to the part-time teacher, there is at present some danger of forgetting that the individual instruction sheet is a means, and not an end, and that it should be used only when it is the best means for the particular end which the instructor has in mind. The individual instruction sheet is not a new thing except in name. It is a combination of several old ideas, the factory job sheet, the correspondence-school lesson leaflet, and the laboratory manual. All of these are well-tested devices and have been used successfully for years. It is not a substitute for the teacher, and is to be looked upon merely as a supplement, though there are probably still cases like the classic example reported by one state inspector who found a self-satisfied instructor sitting at his desk reading a newspaper, with nothing to do because every boy had been supplied with an instruction sheet. It is not a substitute for group or class instruction, it supplements both, and is used in connection with both; it should never be used when either of these more economical methods are possible. In short, the individual instruction sheet has no inherent value in itself except as a device for enlarging and extending the usefulness of the teacher, and aiding the progress of the student who is ahead of or behind the group. By its use the related-subjects teacher is enabled to grade by age and size or by vocational interests, instead of by previous school attainments, and to handle different trade groups and varying rates of progress in the same academic section.

Like every other useful device, the individual instruction sheet has its limitations. It will not work at all with the very low-grade types, because they cannot read it understandingly. The student who can perform the fundamental operations with whole numbers, fractions to sixteenths, and decimals to ten thousandths can use an arithmetic instruction sheet to advantage, even though he may need at first some drill and review on some of the processes. In 99 cases out of a hundred the boy who reaches the part-time class deficient in the fundamental operations will never be able to comprehend them from the printed page, *because he does not know how to study.* This boy must be *taught*—he cannot learn by himself—and the instructor who lays out individual sheets in the fundamental operations is wasting time. This does not mean that drill sheets in these processes are not useful—they are, but only as a supplement to word-of-mouth instruction.

In the next place the individual instruction sheet will not work equally well in all subjects. The writer believes that no work in civics, for example, should be given through these sheets. We do not deny that civics *facts* can be taught thus. The question is, Does the average part-time boy need more facts, or does he need the ability to reason about the facts that he already knows? Experience indicates that to teach civics effectively, the teaching should be done only in the group, where both sides of a question are brought up, and where free interchange of opinion will present a subject from many angles undiscovered by the individual student. The boy who enters a class during the tenth week in which this class has already been in session, will usually get far more benefit from joining the group and participating in its discussions than he could possibly get through individual study of the facts already covered by the class.

Work in corrective English on the individual instruction sheet is also a probable waste of time. The boy who says, "I ain't," "he seen it," "I done it," usually knows better, but he has a bad verbal habit built up by years of practice. The way to correct that habit is to build up another in its stead through short, sharp, intensive, interesting, oral drills on the correct forms, repeated at frequent intervals until they become automatic. The boy has to be drilled on the correct form until he uses it *without thinking,* and this cannot be done effectively or economically by writing out corrective phrases. The ability to talk comes from practice and not from the study of grammatical rules. All of the work in corrective English, and practically all discussion of the problems in hygiene and safety can be done with the group. In machine-shop arithmetic classes, for instance, such general topics as cutting speeds, pulley and gear speeds, screw-thread calculations, use of the micrometer, calculations in regard to levers, time book and payroll problems are units which can be taken up at any one of a dozen places, or in connection with many different projects, and they can be handled just as effectively and much more economically with the group, although the written work following the preliminary discussion will vary according to the capacity of the individual student. Of course, the boy who enters late will have to take his instruction from the individual sheet.

[1]Previous articles on this subject, written by M. W. Muldoon, have appeared in the August and October, 1926, issues of the INDUSTRIAL-ARTS MAGAZINE.

Another limitation is the fact that individual instruction sheets for part-time classes must not be too long—one definite, new point on a sheet is usually enough. Anything having the appearance of complexity discourages the average part-time boy before he begins, or rather it keeps him from beginning. The first instruction sheet on the micrometer made by the writer had three pages of solidly typed descriptive and explanatory matter. It was a total failure. The successor to that sheet worked—the instructor had learned something, even if the boys had not. The second sheet accompanied a blue print, and carried one line of descriptive matter—"The micrometer is an instrument for taking precise measurements"—and five short directions:

1. Study the blue print until you locate the anvil, barrel, sleeve, spindle, and frame.
2. On a sheet of paper for your notebook, copy the sketch in pencil, labeling each of the foregoing parts.
3. If the spindle is threaded 40 threads to the inch, how far will it move in 1 turn? 2 turns? 3? 4? 5? 6? 7? 8? 9? 10? Write your answers to this question in a column on your scribbling paper.
4. If $\frac{1}{40}$ equals .025, write each of your fractions as a decimal.
5. Get a micrometer from the instructor. Notice the change in the scale on the barrel when you make the spindle advance several turns. Then study your list of decimals on the scribbling paper.

When you think you can read the scale on the barrel, report to the instructor to be tested.

The second sheet was successful for three reasons:

1. It was short and easy to read. It had wide margins, double spacing between lines, triple spacing between paragraphs. It "looked easy."

2. It told the boy what to do and the order in which to do it. There was no excuse for loafing or wasting time.

3. It made the boy do for himself practically everything the average part-time boy could do without the aid of the instructor.

To make individual instruction sheets that will work, is not an easy task. Some of the difficulties that beset the novice can probably be best illustrated by samples taken from the writer's summer-school classes. One student handed in a "Unit Instruction Sheet" which began with a good machine-shop-operation sheet, followed by the related academic work. The first section was headed "Trade Science" and consisted of a single question: "Why do you cut under the scale?" A boy with that sheet as his guide has three perfectly good excuses for loafing: "I don't know, and I don't know where to find out"; "What shall I do when I do find out?" "How is the instructor going to know whether I find out or not?" Had the teacher said, If you cannot answer this question, read page 10 of "How to Run a Lathe," the first excuse would have disappeared; if he had said, Write out your answer and hand it in to be checked, or Report to the instructor when you are ready to recite, both of the other two would have been invalidated also.

The second section on that same sheet was headed "English" and was a little more definite:

"Read pages 15 and 16 of.....and write a paragraph on proper dress in the shop."

The part-time boy does not take kindly to the direction, "Read page 15 and write a paragraph." He has had too much of that in the elementary school. He has little power to express himself; he "doesn't know how to begin"; he "hates compositions"; he "just can't do it." Suppose we give him instead an assignment like the following:

WAVERLY PART-TIME CLASSES
Machine-Shop Section

Get Safety Poster Set No. 1.

1. Study the posters until you are sure of the following points:
   a) What are proper overalls?
   b) What are proper shoes?
   c) What dangers are there in the shop from

1. Torn clothing?	5. Long hair?
2. Loose sleeves?	6. Rings?
3. Dangling shoe laces?	7. Gloves?
4. Flowing ties?	8. Poor shoes?

2. Write a paragraph headed "Proper Dress in the Shop," using the above outline. Write at least one complete sentence about each item. End up with a good, strong, concluding sentence. Use a slogan from one of the posters if you wish.
3. Read your paragraph over to yourself, and be sure that you have a period at the end of each sentence. Then use your checking list. Hand in the paragraph.

Checking List

This is to be pasted inside the cover of the notebook or posted in front of the class.

1. Is there a good margin at the left? At the bottom?
2. Is the general appearance neat?
3. Is there a word that is not plain or that needs erasing?
4. Is there one word that I am not sure is spelled correctly? If there is, look it up or ask the teacher about it.
5. Is the paragraph indented?
6. Have I stopped at the end of every sentence?
7. Do I need any more capitals?
8. Is the paper signed?

The experienced teacher of full-time day-school classes who reads this combined English and hygiene lesson will probably say, "You are giving that boy too much help." Not more than the part-time boy usually needs. She would probably word the assignment as did the summer-school student, but the experienced part-time teacher will prefer the recommended form; it gives the boy a definite task that lies well within his ability, allows him no excuse for loafing or for wrong arrangement of work, and helps him to correct for himself at least part of the errors of his first draft. With a little extra care in planning, much definite instruction in English can be combined with the work in other subjects, as is illustrated in the safety lesson. Most of the practice in logical arrangement of material, in outlining, paragraph writing, and in "two-minute speeches" will be secured incidentally under the head of hygiene or civics.

The samples which follow, are not given as models that are beyond criticism. They are just lessons that have really worked with actual classes of part-time boys.

WAVERLY PART-TIME CLASSES
Machine-Shop Section
HAND TOOLS—UNIT 1

1. Read "The Lathe," pages 217 and 218, to "Screw Drivers."
2. Learn to spell:
   peen
   machinist's hammer
3. Look up meaning of "swagging" in the dictionary.
4. Study pages 217 and 218 until you are sure of each of the following points:

MACHINIST'S HAMMER

a) Material.....
b) Range of weights.....
c) The commonest weights are under.....
d) The main parts of the hammer head are.....
.....
e) The three kinds of peens are.....
f) The handle is fastened into the eye by.....
.....
g) The handle is set.....with head
h) The handle should be grasped.....
i) The most effective blow is made by.....
j) Care should be taken in using not to.....

SOFT-FACE HAMMERS

a) The material is.....
b) Where used.....
c) When used.....
d) Why used.....

Study the pictures as well as the text.

5. HAND IN YOUR TEXTBOOK.
6. Write a paragraph on "Machinist's Hammers," using the above outline. Write a complete sentence about each item. Be sure you have the correct headline, title, and margins. Indent the first word of your paragraphs.
7. Read your paragraph to yourself, and be sure you have a period at the end of each sentence. Ask about the spelling of any word that you are *not* sure is correct. Check your margins.

(Hand in Your Paper for Correction)

WAVERLY PART-TIME CLASSES
Machine-Shop Section
HAND TOOLS—UNIT 4

1. Learn to spell: Look up:

wrench	ratchet
alligator wrench	spanner
spanner	
leverage	

2. Study pages 221 to 223 of "The Lathe" and the pictures on page 222, until you can answer the following questions. Write the answers (in one word, if possible) on a separate sheet of paper, and check by the answer sheet. Ask for help if necessary.

WRENCHES

a) Tool used for.....
b) Principle parts.....
.....
c) The S wrench is named because of.....
d) The tap and pipe wrenches because of.....
.....
e) The ratchet wrench because .....
f) Because the wrench is a lever, the mechanical advantage depends on the.....
g) Wrench handles are short because.....
h) A piece of pipe is sometimes used to lengthen a wrench handle on heavy work because.....
i) Rounded corners on nuts and bolts show that the workman .....
j) Avoid use of too large wrenches because.....
.....
k) Purpose of a 22½-degree angle wrench?
l) Purpose of a 15-degree angle wrench?
m) Purpose of ratchet wrench?
n) Purpose of a Stillson wrench?

(When You Have Finished, Ask for the Next Assignment)

Sheets similar to these will work because they tell the student what he is to do, and the order in which he is to do it; they tell him where to find his material, help him to check his results, and keep him from wasting time. Besides the practice in written English, both sheets given incidental practice in spelling, dictionary work, and silent reading, as well as teaching the boy how to study. The number of things that he does not know about a page after he has read it in his own way is usually an eye-opener to the beginning part-time boy, and, as a rule, he spends considerable time on each of his first two or three sheets. For exactly this reason his early assignments are very definite. As he progresses, more will be taken for granted, he will be allowed more freedom in outlining, and given fewer directions for checking. While the student using these samples is incidentally securing some little trade information, it should be remembered that the aim of the academic teacher who planned them was not trade information, but *training in English*. The trade material is being used, not for its own sake, but to motivate the language work. The student is also being gradually trained in the use of trade literature.

Whenever possible, instruction sheets in arithmetic should lead the student to make his own rule or formula, instead of stating it for him. The boy gets the same arithmetic facts, plus a much-needed training in logical thinking. It may take a little longer, but the student *understands* his formula, besides knowing how to use it. Take, for example, the following samples:

WAVERLY PART-TIME CLASSES
Machine-Shop Arithmetic

UNIT 8

Do Not Write on this Sheet.

1. Copy the form on a sheet of notebook paper.
2. Measure the circumference of each of the three disks to the nearest 16th inch, and then fill the blanks on the form.

Diameter of Circle	Circumference of Circle	Ratio Circumference ÷ Diameter
3½ in.	.....	.....
7 in.	.....	.....
14 in.	.....	.....

3. The result would be about the same if you measured a hundred disks. In *every* circle the circumference is about..... times as long as the diameter. This ratio is called "pi," pronounced like pie.
4. If I know the diameter of a circle I can find the circumference by.....

Take this sheet to the teacher before you do any further work.

5. Work out the following problems:

TEST PROBLEMS

a) Find the circumference of a 2-in. circle.
b) Find the circumference of a 3½-in. circle.
c) Find the circumference of a 4¼-in. circle.
d) You are turning down a piece of steel 1¼ in. in diameter. How long a shaving can your tool take off in one turn?
e) How long a shaving could be taken off in one turn if the diameter was 1$\frac{7}{8}$ inches?

The student receives with this lesson three wooden disks, 1 in. thick, measuring 3½ in., 7 in. and 14 in. in diameter, a stout string, a ruler, and a tape measure. The disks have the diameters ruled on them in pencil, and the dimensions are given. They were turned by one of the boys in the woodshop about five years ago, have been used since then by class after class, and they are good for a long time to come. If a boy knows how to find the circumference of a circle he is, of course, excused from this lesson, but if he "knew how and forgot the formula" he must take it.

The next sample is a specimen of an individual sheet for the boy who enters late, but who needs information which was given to the class as a group lesson earlier in the course.

WAVERLY PART-TIME CLASSES
Machine-Shop Section
THE LATHE—UNIT 1

Get a mounted picture of the lathe, and a copy either of "The Lathe" by Burghardt, or "First Year Lathe Work." The second is the easier to study.

1. Study picture on page 26 of "The Lathe," or on page 4 of "First Year Lathe Work" until you think you are sure of the principal parts.
2. Test yourself on the numbered drawing. Study again if necessary until you can name all of the numbered parts with the book shut.
3. Place numbers from 1 to 14 on a separate sheet of paper, as if for a spelling lesson. With your book closed, write the names of the numbered parts on the drawing, after the numbers on your sheet.
4. Open the book and check your answers. When you know the parts perfectly, report to the instructor to be tested, and to have your mark recorded on your progress sheet.
5. Return your book and picture to the place from which you first took them.

(The mounted picture of the lathe was cut from the advertising pages of a trade magazine, and the principal parts numbered by the instructor in red ink.)

The student working on an individual program must do considerable silent reading with little supervision. How to secure attention to business, check speed, and test comprehension of the material read, was a problem solved in the writer's own classes by a device called an "Oral Test Sheet," some samples of which follow:

WAVERLY PART-TIME CLASSES
Safety Test No. 1

Name..... Date.....

1. The first thing to remember in a machine shop is.....
.....
2. What must I do with long sleeves?.....
3. With my tie?.....
4. With my ring?.....
5. With my gloves?.....
6. When must I oil and clean my machine?.....
.....
7. When can I safely wipe off a machine?.....
8. When is it safe to feel the edge of my shaper tools?
.....
9. What must I do if my drill gets caught?.....
.....
10. What must I do before I caliper or measure my work?....
.....
11. What must I do if I wish to set a cutting tool?.....
.....
12. What must I do if waste gets caught in a machine?....
.....
13. How should I remove chips from a moving drill?.....
.....
14. When is the time to make sure my work is firmly bolted or fastened?.....
15. Five things I must *not* wear around machines:
.....
.....
.....
.....
.....

REMEMBER: It *Hurts* to get hurt. *Prevent* accidents.

WAVERLY PART-TIME CLASSES
Safety Test No. 2
LIFTING

1. Two injuries resulting from improper ways of lifting are:
   .....
   .....
2. THE RIGHT WAY TO LIFT
   We bend at the.....
   The back is kept.....
   The feet are placed.....
   The shoulders are.....
   The strain comes on muscles of.....
3. It is wrong to bend at.....because the strain comes on.....

SWITCHBOARDS

4. Never touch a dangling wire because.....
5. To remove a victim from a live wire:
   Do not touch.....
   Stand on.....
   Protect your hands by.....
6. Resuscitate him by using.....
   Keep it up at least.....if he does not recover.
7. IN USING OUR SWITCHBOARD:
   Stand on.....
   Use .....hand.
   Keep other hand.....

WAVERLY PART-TIME CLASSES
Electricity

Get Safety Poster Set No. 1.

1. What shall I do with my sleeves?.....
2. What kind of handles should I have on my tools?.....
   .....
3. How should I treat any circuit, even if thought dead?
   .....
4. Should one or two hands be used while working at a switchboard? .....
5. Can I depend on the insulation of wires to keep me from shock? .....
6. Why not?.....
7. What care is needed when doing electrical work while standing on damp floors?.....
8. What should I do with wet clothing?.....
9. Why? .....
10. What danger is there looking at an intense arc?.....
    .....
11. When does the pain in the eyes begin?.....
12. What shall I do if I have so exposed my eyes?.....
    .....
13. I should avoid wearing articles made of.....
    .....
14. Before beginning to work on any piece of machinery that could be started by another while I am working on it I should.....
15. All voltages over.....are dangerous to safety...

REMEMBER:
I must not take risks on *any* voltage.
It *hurts* to get hurt.

Do not write on this paper. Number another sheet as if for a spelling lesson. Write the words to fill the blanks after the proper numbers on the separate sheet.

These oral test sheets were originally invented to serve as a study guide for a lone electrician's apprentice who had to recite in a related-subjects section where all the other members were machinists' apprentices, but the sheets have worked out successfully in many other ways since. The blanks call attention to the exact points that are to be emphasized, the answers come in complete statements, they are easier and quicker to use than question sheets, and the boys seem to find them more interesting. Sets like the safety test, and the sheet on speeds of gears are passed out after a demonstration or study period for a quick oral test. They may be collected and the test repeated as often as necessary orally, then finally used for written testing, held to a given time limit or not as the teacher wishes. One test sheet, in a folder with the necessary reference material, makes a study guide for the new boy or the absentee making up work. Five minutes of spare time may often be profitably devoted to review given through one of these tests. We used to have the work done directly on the sheet, but that made a great deal of trouble for the instructor who was obliged to duplicate the new tests, so the boys are now asked to place numbers, as if for a spelling lesson, on a separate sheet of paper, upon which they then write their one-word answers. Results seem to be equally satisfactory. Of course, the boy who arranges his work badly may be required to copy his test sheet, filling in the blanks as he copies it. The chief advantage of these sheets is that the boys are kept profitably occupied for 30 to 45 minutes. The instructor can then check the student's work in a minute or two. Furthermore, the student works cheerfully, where he would rebel if asked to "read, and write a paragraph."

A similar device, used to test group results in silent reading, is known to the boys as a "fact test." They number their papers as if for a spelling lesson, the teacher asks the questions with a moment's pause after each one; the boys write their one-word answers, and then the results are checked as the correct answers are read. It aids materially in securing both speed and comprehension of the matter read.

One marked disadvantage of the use of individual instruction sheets without some group work, is the loss of community or school spirit. The four-hour teacher should begin his half day with a subject like civics in which classwork can be given; the teacher of departmental work should open the recitation with at least five minutes of group work, and then proceed to the individual programs. Without this, the work will grow lifeless, and the progress will slow up.

Most of the time used by the instructor in checking or correcting work can be saved if a master sheet or answer sheet is kept at the desk. The boys working on individual programs are frequently able to check their own work without assistance, there is little temptation to dishonesty because they are not working for marks, and if the work is practical enough there is usually a genuine desire to "get the right answer."

Experience will prove that it pays the instructor to preserve and file every lesson of this kind that is laid out. In the writer's own class, every September for three consecutive years a new apprentice reported from the same contractor's shop, each one needing an individual program because he was the only electrician in the class. The work planned for the first boy exactly fitted the needs of the boy who stepped into his shoes, and convinced the instructor that the time expended in filing was well spent. An occasional part-time teacher rebels against the labor of laying out individual programs, as "too much trouble for just one boy." We must remember that we take that boy off his job, and that either he or his employer is losing four hours' pay once a week. In all fairness they should get what has been paid for. Granted that making individual lesson plans is hard work, often tedious, and that it is likely to take much of the instructor's out-of-school time, we still believe that the teacher who is not willing to take considerable trouble for "just one boy" does not rightfully belong in a part-time school.

Sometimes when every point mentioned in this chapter appears to be beyond criticism, a theoretically perfect sheet may not show good results in actual classroom use, which after all is the only thing that matters. The test of any sheet is not *can* you use it, but *do* you use it? Probably the best way to build satisfactory sheets is to plan the lesson as completely as possible, put it on the board instead of on paper, try it out on one class or group, revamp where experience proves that it is necessary, and then preserve for duplication in the form in which it finally "got across."

Of course, in planning the academic work it is to be understood that the shop teacher makes his shop-operation sheets, lists tools and materials, lays out the related drafting, and lists all the trade mathematics, trade science, trade terms, and safety information that must be known to complete the job. He lists all the facts that he, personally, will teach in the shop. With this as a basis the academic teacher lays out the mathematics, safety and hygiene, civics, and English to be taught in the classroom, correlating the academic work and the shop-work unless the same principles have been covered in a previous unit. The academic teacher may, and probably often

does, improve the student's vocational efficiency, but the real aim behind correlation is *not vocational efficiency but motivation of the academic work.*

The technic of laying out usable individual sheets becomes easier after a little practice, but the beginner will have less trouble if he remembers that he must put on the pupil's sheet exactly the same material that he would put on the board for a class lesson, plus all the directions that would be given the class verbally, the whole boiled down into the fewest words, and expressed in the simplest language possible. First, take your shop instructor's course of study or lesson plans, and make an orderly progressive layout of the topics you will cover because they are correlated to his work; that is, outline your lesson units—find out *what* you are going to teach. Then take the first item and lay out a teacher's lesson plan for a group lesson on this item; that is, find out *how* you are going to teach it. Not until you have done all of this are you ready to begin the actual laying out of your individual sheet.

On that sheet, first list your reference material, and tell the student where to get it. Then tell him in separate, definite statements exactly what you want him to do, *in the order in which he is to do it.* Be sure that your language is clear, simple, and concise, and that you are using terms that the student will understand. If unfamiliar terms are necessary, define them. Leave wide margins, and use double or triple spacing. Make the sheet as short as you can—never more than one page long. Cut into smaller units if necessary; one big item on a page is usually sufficient. Put your completed sheet on the board and try it out on a group or even on an individual. Revamp where necessary, and after you know that it works, duplicate and file your sheet. It is unwise to make many copies of an untried lesson.

The instructor should remember that each successive sheet should place more responsibility upon the student. The first sheets must be very explicit; successive sheets grow less so. The student must be taught to use his head as well as his instruction sheet.

The difference between a teacher's lesson plan, and the individual instruction sheet based upon that plan, can probably best be illustrated by giving actual examples.

Teacher's Lesson Plan for Group Lesson

AIM: Understanding of the term "cutting speed." Ability to use formula.

MATERIAL: For low-grade class: small wooden cylinder; string to represent shaving; cutting tool; steel shaving; cylindrical stock. Probably a visit to the shop to see the machine. Average class: wooden cylinder and cutting tool, or piece of cylindrical stock and cutting tool.

STEPS IN TEACHING ORDER:

1. Review terms: R, D, Circumference of circles; r.p.m.; pi.
2. Where does tool touch work? How can you find length of shaving taken off in one turn? Find it.
3. What is r.p.m.? How long a shaving at this r.p.m. will be taken off in one minute?
4. Explain the term "cutting speed." It is always given in feet. Change your answer to feet.
5. Develop good definition of "cutting speed."
6. Develop formula.
7. Suppose we had taken a cut, and that the diameter had been reduced to $\frac{1}{8}$ in. Find the effect which the reduction of the diameter has on the cutting speed.

TEST: Pass out the individual problem sheets, or work from the problems on the board.

Pupil's Individual Instruction Sheet for the Same Lesson

To be used by the boy who is ahead of or behind the group, or by the boy who enters late, or is making up for an absence.

WAVERLY PART-TIME CLASSES
Machine-Shop Section
UNIT NO. ....
CUTTING SPEEDS

DIRECTIONS:

1. Get the material for this lesson from the instructor. You may not need to use it.
2. Do Nos. 1, 2, and 3 at the board. Write out No. 4 there. When you have finished No. 4 ask the instructor to check your work at once. Then do the rest of the work on your notebook paper.

LESSON:

1. Your lathe tool touches the circumference of your piece of stock, which is exactly 1 in. in diameter. How long a shaving can the tool take off while the work revolves once.
2. If the stock revolves 125 r.p.m., how many inches of shaving can the tool take off in one minute?
3. Change your answer to feet, and mark it *"Cutting Speed."*

Cutting Speed of a lathe tool means the rate at which it passes over the work. The length of the shaving which the tool takes off in one minute would be the same as the cutting speed.

Cutting speed is always given in feet per minute.

4. Make a rule for finding the cutting speed.

(Ask to Have Your Work Checked Now.)

SEAT WORK:

1. Find the cutting speed if you are turning down a piece of cast iron $\frac{7}{8}$ in. in diameter, if the lathe spindle makes 168 r.p.m.
2. Find the cutting speed if you are turning down a brass rod $1\frac{1}{4}$ in. in diameter, at 252 r.p.m.
3. Find the cutting speed of your tool when you are working on a $\frac{1}{8}$ in. casting, at 135 r.p.m.
4. Find the cutting speed of the same tool, using same r.p.m. if your casting has had its diameter reduced to $\frac{1}{8}$ in.
5. Copy the definition of cutting speed.
6. Write the formula for cutting speed.

(Hand in Your Work to be Checked)

Correlating the Related Work with the Shopwork
Lesson Unit for the First Week of School

Machine-shop class, all beginners, age 16, working on first projects (cold chisels, screw drivers, center punches); two hours shop and drawing, two hours related work.

Shop Instructor's Plans

Shop: Cutting off stock with hack saw, by hand. Names of hand tools, of power machines in our shop; recognizing line shaft and countershaft. Starting and stopping lathe; allowance for cutting off and centering.

Drawing: Demonstration by teacher of method of sharpening pencil; placing paper on board, use of necessary instruments, drawing of three views of block. Pupils make working drawing of small piece of rectangular stock, dimensioned. Reading of similar drawing.

Related Work

The related work is to be planned by the teacher of academic work, and is to be based on the shop instructor's plans.

Mathematics: Reading of scale to sixteenths; blue-printed test on reading scale; brief practice on "rule of thumb" addition of fractions on the ruler. All group work, except the test, which is to be written by each student without assistance.

Hygiene and Safety: Proper dress in the shop. Thrift (save your street clothes) and safety emphasized. Loose clothing, ties and rings, broken shoes, long sleeves, no caps, "safety first" discussed. Outline for oral paragraph made.

All group work. The students copy the outline in their notebooks.

Civics: Blind-alley job defined. Is yours a blind alley? Why, or why not? Some examples in town noted. Discussion of various jobs to see whether they are blind-alley jobs, or whether the trouble is with the blind-alley people who fill them.

All group work. There is no written work.

English: Oral paragraph on the "safety" lesson. Copy the trade terms in the notebook. Use the trade terms first in oral, then in written sentences at the board. If time permits, start study of parts of lathe.

Sentences at board done by individuals. Class criticism.

Trade Terms

elevation	motor	shafting
profile	shaper	countershaft
working drawing	lathe	hack saw
square stock	round stock	drill press
	scale	

Lesson Unit for the Second Week of School
Shop Instructor's Plan

Shop: Laying out and centering. Review allowance for cutting off and centering. Methods of centering. Names of tools, and some parts of the lathe. Demonstration of oiling and care of the lathe; starting and stopping; locating centers; placing job in lathe; adjusting tools; taking first cut.

Drawing: Continued from first week. Read three very simple blue prints. Representation of invisible edges; teach construction lines; review placing of dimensions.

Related Work Based on the Foregoing

Mathematics: Brief review of reading, scale; reading blue prints to find over-all dimensions; drawing lines of given length, tested by exchanging papers and measuring lines; allowance for cutting off and centering discussed; over-all dimensions of several projects given (to be found in study period). Individual work in addition of fractions where necessary.

Group work at the beginning of the lesson. Individual work begun, and students told that each one may work as fast as he can.

Every mathematics lesson after this will start with group drill, but the rest of the period will be given over to individual work.

Hygiene and Safety: Conduct in the shop. (Use cases of students who had been hurt by practical jokes in the shop as a lead.) Inattention; throwing things instead of handing; keeping the floor neat; danger of working on machines when sick or very sleepy; starting and stopping machines; shifting belts; ethics of reporting others who are careless.

Group, and individual reading of assigned topics, in safety manual.

Civics: Importance of machinist's trade. Mental, moral, and physical characteristics necessary; self-checking on a rating sheet; hours and wages in local plants.

Group discussion interspersed with reading on assigned topics.

English: Trade terms copied; five minutes in study of the parts of the lathe; reading for reports in civics and hygiene; lesson on how to study spelling.

Group shown how to use index and table of contents. Each student copies the terms in his notebook. The remainder of the time is spent on individual assignments.

PLANNING A MECHANICAL-DRAWING COURSE

Harvey W. Waffle, Kilbourn High School, Kilbourn, Wisconsin

IN planning a course of study for the mechanical-drawing class, the instructor should realize that the subject is one of unlimited scope, and that the subject matter chosen for the course must be chosen carefully according to its relative worth. Any teacher, to be successful, must have an interest in the pupil as well as in the subject matter to be taught. He must have a sense of value in the outlining of his course and an understanding of its relation to the other branches of human knowledge.

Teachers of mechanical drawing are realizing more and more the magnitude of the subject and its relation to the other subjects taught in our schools. It is expected that every teacher who is attempting to start a class in mechanical drawing has had special training in the subject as to the theory and practice, the methods of teaching, and that he has studied its educational possibilities. The teacher should also have a well-rounded general education so that the value of other courses of study in the curriculum can be realized. Mechanical drawing, if rightly taught, develops the ability to think, the ability to visualize, the ability to imagine, and the ability to do.

There are certain things that the teacher should endeavor to accomplish while he is teaching a given course. These things are know as the "objectives" of the course. The following are the objectives of a mechanical-drawing course:

1. To awaken vocational interests in the pupils.
2. To develop personal traits of patience, perseverance, industry and integrity.
3. To develop an appreciation of art through good design; harmony in form and initiative in selection, and design.
4. To develop thoroughness, accurateness, and neatness.
5. To set up ideals of good workmanship.
6. To develop a spirit of cooperation.
7. To make contacts with the practical applications of the studies of mathematics, sciences, etc.

Every course in mechanical drawing should be analyzed according to the following considerations:

Its value in the curriculum.	Presentation of problems.
Purpose of the course.	Recitations.
Methods to be used for teaching.	Tests and measurements.
Results of the methods.	Grading methods.
Selection of problems.	Technical information.

The following course has been used by the author for the past four years.

Supplementary Instruction

I. Essentials of Drawing
   1. Mechanical
   2. Architectural
   3. Machine
   4. Free-hand

II. Equipment
   1. Instruments
      a) Kinds
      b) Grades
      c) Names of parts

III. Use and Care of Instruments
   1. General construction of instruments
   2. Best methods of using each
   3. Using "French curve"
   4. Using lettering triangles
   5. Reading scales
   6. Using protractor

IV. Kinds of Ink
   1. Use of various colors of ink
   2. Removing ink from drawings
   3. Care of ink

V. Tracing Cloth and Paper
   1. Cleaning tracings
   2. Preventing cloth from stretching
   3. Uses of each

VI. Letters and Figures
   1. For mechanical drawing
      a) Slant
      b) Vertical
   2. For architectural drawing
   3. Block letters

VII. Applied Geometry
   1. Geometrical problems

VIII. Blue Printing
   1. Using artificial light
   2. Using sunlight
   3. Washing, drying, trimming
   4. Making Van Dykes
   5. Uses of Van Dykes

Technical Instruction

I. Theory of Representation of Objects
   1. Procedure in laying out a drawing plate
   2. Conventional representations

II. Theory of Projection

III. Rules of Dimensioning

IV. Detail Drawings

V. Governing Factors of Construction
   1. Simplicity
   2. Stability
   3. Efficiency
   4. Strength of materials
   5. Principles of design
   6. Bill of materials
   7. Organization of a commercial drafting shop

Elementary Drawing

I. Lettering

The instructor should devote considerable time at the beginning to emphasize the importance of lettering. The student should be taught to realize that a drawing amounts to little as far as appearance is concerned unless letters and figures are carefully formed. He must understand that guide lines are necessary, that a single stroke is to be used, and that lettering requires constant practice.

II. Uses of Instruments
   1. One-view drawings
      a) Lines
      b) Arcs and tangents
      c) Combinations

III. Conventional Symbols

IV. Dimensions
   1. Application of rules of dimensioning

V. Orthographic Projection
   1. Planes of projection
   2. Selection of views

VI. Auxiliary Views

VII. Pictorial Drawing
   1. Isometric
   2. Oblique
   3. Perspective (very elementary)

VIII. Developments
IX. Shop Problems
X. Working Drawings
1. Classification
a) Sketching
(1) cross-section paper
(2) free-hand
(3) outline
b) Working from sketch
c) Working from plates
d) Working from sketch furnished by another student
e) Working from pattern
f) Working from a part or casting
g) Working from assembled machine
2. Planning
a) Selection of views
b) Selection of scale
c) Selection of sections
3. Types
a) Detail drawings
b) Assembly drawings
c) Outine drawings
4. Notes and specifications
5. Bills of materials

After the student has completed a plate, he hands it to the instructor who carefully checks it for errors. This may be done by one of two methods:

First: The instructor checks the plate according to the grading chart and places the number which corresponds to the error on the chart in the spaces for that purpose in the title block. Each error counts as a demerit and determines the grade according to the chart. Or

Second: The instructor checks the several plates of the class and arranges the plates in five groups or piles as determined by the number of mistakes made by the student. According to this method, there is always a normal distribution of grades in the class. There is one disadvantage to this system in that the instructor cannot grade the plates until every student in the class has that particular plate in.

The chief object in grading a plate in drawing is to get the student to strive toward a higher point of perfection. We, as instructors, should strive to interest the student in doing the highest grade of work possible with his natural or acquired ability. A grading system interests the student in his work and challenges him to do better.

Corrections on a drawing should give a student knowledge of the errors which were made upon that particular plate so that upon future plates the same mistakes will not be made. It is not only necessary that the student locate these mistakes but corrections should be made upon the plate as well. It is not necessary to locate the error on the plate

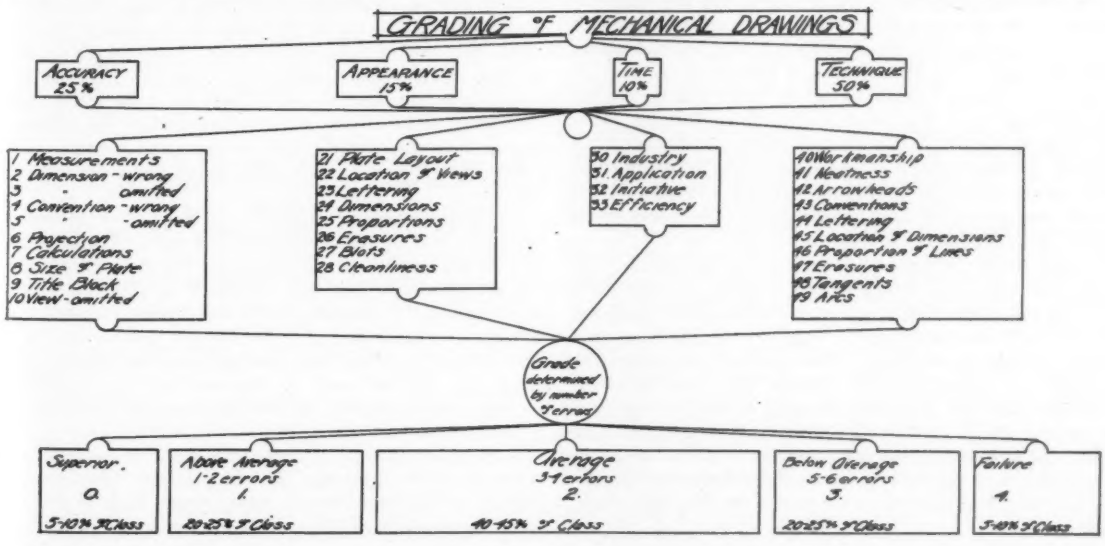
KILBOURN HIGH SCHOOL
Manual Arts Department

Name Magnus Gunnells Course Mech. Drawing Section 25
Class Freshmen Period 3rd Bench No. 11 Drawer No. 7
Drawing Set No. 11 T Square No. 11 Scale No. 11 Semester Av. 1.0

Date Due	Title of Drawing Plate	Graphed for Course	Date Plate was handed in for check
Sept. 9	Lining and Compass Exercise		
" 14	Geometric Problems		
" 22	Conventional Symbols		
" 28	Dimensions		
" 28	Support Blocks Orth. Proj.		
Oct. 2	Adjusting Blocks " "		
" 5	Step Bracket " "		
" 11	Truncated Sq. Prism Aux. "		
" 18	Angular Casting " "		
" 22	Angle Stop " "		
" 29	Hung Bearing Isometric		
Nov. 6	Lever "		
" 11	Protected Bearing Section		
" 17	Yoke "		
" 25	Truncated Rect. Pyramid Development		
" 29	Pint Measure		
Dec. 6	Bracket Bearing Working Drawl.		
" 11	Shop Problem Cabinet "		
" 15	Shop Problem " "		
" 22	Tracing		
" 27	Tracing		
Jan. 2	Blue Print		
" 18	Cover (Design - Original)		

Students Record

in checking, but the students should discover the error and make the correction whenever possible. In the author's class the plates are returned to the instructor after the corrections have been made, to be O.K'd and filed. No student receives a passing grade until all plates, tracings, and blue prints have been assembled in a cover and handed in. It is wise to set a day, such as the last day of the semester, when all plates must be in, checked, corrected, O.K'd, and assembled in the cover or the student receives a failing grade. This prevents the straggling, slow student from receiving the same grade for his work that a student of average speed and ability gets. All plates handed in late during the six weeks' period are subjected to a deduction of 5 per cent of the grade



earned by that particular plate. This ruling may appear harsh but places the responsibility upon the pupil. In case of excused absence, an allowance of time is made for the students to work during spare periods and after school.

It is not unusual to have the shop filled with students every night during the course, attempting to keep ahead of their work instead of falling behind. Plates may be given to the students ahead of schedule if each plate is finished before the date on which it is due. This last semester, an upper-class student who came into the course late, finished in 9 weeks with the extra time that he put in and received a final grade of 90 in the course.

Conclusion

The foregoing course of drawing has been used with slight changes by the author for the past four years and has given excellent results.

THE ARTS IN MINING-CAMP SCHOOLS

Clara B. Fishpaugh, Prof. of Education, West Virginia Wesleyan College, Buckhannon, W. Va.

THE curriculum which we understand as the course of study plus extra activities is the expression of the attempt of the school to function in terms of needs, both individual and social. We must understand those needs in order to adapt the curriculum.

A mining community, in which the inhabitants "no foot of land possess," live in company-owned houses, buy their provisions for the most part from company-owned and operated stores, worship, if they worship at all, in company-owned buildings, and send their children to schools built upon company property, presents a problem in education differing essentially from city, town, or rural situations.

Lack of ownership makes for a shifting population and breeds lack of feeling of responsibility for property, both public and private. Miners, as a class, place much emphasis upon freedom and their rights, but fail to see that their rights stop where the rights of others begin.

It was my privilege to superintend the schools of a mining district some fifty miles in extent—a territory in which all property was company owned. The population was made up of 90 per cent white Americans, and 10 per cent foreigners and negroes, so our problem was that of our own people.

Desiring to secure an expression from the children, I asked them, in the course of a visit, to whom the school belonged. There was a unanimous response—"To the coal company." I answered that it did not and gave reasons for the statement and then came the answer from some that it belonged to the school board, others said it belonged to me. They were greatly astonished when I told them the school was theirs, that it existed wholly and solely for them, and every time one of them destroyed school property, he destroyed something which prevented him from having the use of needed equipment and also prevented others who owned a share, to use that to which they had a right. While the new idea was interesting, we discussed plans for taking care of their possessions. The result was the working out of a practical course in manual training to be followed in the course of time by manual art. Care of tools was agreed upon and we set out repairing steps, replacing boards in the walks, hanging doors, making gates, making and replacing palings, and other work about the buildings, that they could do. They began to think constructively instead of destructively, and it was not long before the workers became very vigilant and saw to it that others did not undo their accomplishments.

Achievement tests revealed 46 per cent retardation, due not so much to lack of intelligence as to nonschool attendance. The compulsory-attendance law was, therefore, strictly enforced with the result that many pupils from two to four years over age were in the lower grades. The practical manual-training work offered a solution to this problem for it not only kept them employed, but motivated learning to read, to spell, to use good language, orally and written, and to calculate accurately. These pupils were kept working to their maximum capacity and were too busy to be at all troubled over the fact that they were in grades where there were smaller and younger children.

The next step was to interest them in general community betterment, to induce the nailing on of a loosened paling instead of pulling it off. An appeal had to be made to that sense of "being easy to look at." We were anxious to have the work carry over into the home, so we listed articles the children desired to make for their own use; toys, many small articles for individual and home use, for the dramatization of stories, for carrying out of health projects. At no time did we cease to hold to the principle that the use of a thing demands our attention and care. The houses we live in may not be our own, but the fact that we have our needs in part served by them, places a grave responsibility upon the occupant for the care of that which satisfies his need wholly or in part.

A mining camp affords many opportunities for furnishing laboratory methods to the student and by securing the cooperation of the company, it was possible to place over-aged boys in shops with electricians, plumbers, carpenters, and upon car repairs for two or three hours a day with pay. Only those in school were given these privileges. The work in school was as closely as possible correlated with the work in the shops.

The camps were subject to floods. Heavy rains brought great streams down the mountain sides, and the creeks overflowed, and drain pipes were unable to carry off their added burdens. The children of the upper grades were given the project of devising a means of overcoming the difficulty and calculated the size of pipes necessary, the changing of the course of the largest streams and the best places for culverts and bridges. They drew their plans, which were very crude, but they had an opportunity to express themselves and to actively participate in the constructive problems of the camp.

The girls made doll houses, decorated the walls, wove rugs, blankets, designed curtains and furniture. They studied the woods and designs appropriate for the various kinds and color schemes for all furnishings. The boys helped with the roofing, placing windows and partitions. Costumes were studied by dressing dolls. In all the work, the application of materials, colors, and designs to the homes in which they lived and to their clothing was emphasized. The way was now ready for work in the manual arts; classes in serving, embroidery, crocheting, and basketry were formed and in the exhibits at county fairs, many prizes came to this mining section. As a matter of fact, the district led the surrounding country at these fairs.

The fundamental problem is to develop an appreciation of beauty in a situation where all the work of man is ugly. The natural setting of the mining community was wonderful, but man had marred it with hideous structures. A class was taken out on the mountain, from which point the scenery was magnificent; attention was called to the picture, when a 16-year-old girl remarked that she had lived all her life in the camp, that she had stood on that very spot again and again, but that she had never noticed the river that had just been pointed out to the class.

It is the privilege of those who teach to lead the young to form a habit of taking "the long look." "The short look" about a mining camp reveals only ugliness, while in "the long look" the panorama reveals the beneficent hand of the Creator.

It has always seemed to me that the teacher of art has a little advantage over the teacher of other subjects, in opportunities of enlarging visions and enriching lives.

The camp was at this time unionized; the word organization had a rather definite meaning, so there was no difficulty in organizing groups in schoolwork; the nature-study class was one of these groups.

From window gardening in the schoolroom to window gardening at home is but a short step, and it is not a long distance from that to planting flowers in the yard and placing them in artistic arrangements.

A complete survey had been made of the types of pictures, music, and literature available in the homes. Many homes had victrolas but very poor records. We were able to secure a very fine victrola and records of the best types of music. From time to time public programs were given and it was not long before teachers were asked to recommend records for the homes.

Drawing furnishes an outlet for the emotions and a means of expressing thoughts clothed in delicate shades of meaning. How often do I have college students say to me, "I can't explain it, but I can illustrate it!" Drawing was used as one of the means of producing an audience situation in reading. The children illustrated their individual assignments, the class selected the material illustrated and read silently, then someone was called upon to read orally.

An art exhibit is one of the surest ways of developing appreciation, but there is constant need of an opportunity for self-expression.

The great need of the mining class is culture, but it must be brought into everyday living. There can be no separation of the cultural from the vocational; art, music, and literature may live in the lives of those who labor in dark places.

Four years' experience in this type of schoolwork and in investigating industrial situations, convinces me that the arts should be made the central core of the curriculum for mining-town schools, and the approach must be made through the practical application of principles that will refine living conditions. Art offers the best means of developing the social instincts. Miners are very individualistic in times of peace, and so far as my experience goes, no subject affords the development of altruism as does that of art. Art affords a moral situation, there's little chance of "getting by"; work must be honest, it stands on its own merit. The very best results in teaching ideals of citizenship come by way of art principles. We used a set of cards, artistic in form, color, lettering, and decoration. Each card contained a statement that furnished the motive for discussion. The cards were then arranged in attractive albums. No child willfully missed a class and in nearly every case where absence was unavoidable, the request for the cards used came from the home.

Art will function in a mining community. The surest way for the schools of mining towns to influence homes is by applying the principles of art to the lives and occupations of the people as we find them and by gradual development lead out to a larger and richer view of life and modes of living.

THE VOCATIONAL TEACHER AND HIS BLACKBOARD

Wm. A. De Vette, Wilson Junior High School, Erie, Pa.

(Second Article)

IN the first article, methods were discussed whereby it would be comparatively simple for any vocational or industrial-arts teacher to make very presentable drawings on his blackboards, both in parallel and angular perspective. The discussion, however, was limited to rectangular and oblique-line objects, and did not include anything at all about curves and circles. The making of perspective circles will be discussed in this article.

Perspective of Circles

The difficulty in drawing a perspective circle on the blackboard is very often overestimated. It must be admitted that it does seem somewhat difficult to draw an ellipse free-hand which is symmetrical about both horizontal and vertical center lines, which has just the exact width to give the drawing the proper appearance, and which is not bumpy along the sides or too pointed at the ends.

However, when it is taken into consideration that a square may be circumscribed about any circle, the circle being tangent to all sides of the square at their middle points, it can readily be seen that the same thing may also be reversed and that a circle may be inscribed in a square. Then if one draws a square in perspective, he may easily sketch within it an ellipse which is a circle drawn in perspective. By adding center lines to the square, it is made still more simple because then the points at which the curve must lie tangent to the sides are located.

The method just described is illustrated in Figure 7 which shows a disc in a horizontal position placed below the level of the eye. Note particularly that the vanishing point of the receding sides of the square is directly behind the center of the square itself. In making perspectives of circles, parallel perspective must be avoided unless the vanishing point can be placed as is shown in this figure. The next illustration, Figure 8, shows very plainly the distortion which results when this rule is not observed.

The reason for the distortion lies in the fact that the long diameter of the ellipse is not perpendicular to the axis of the cylinder. A definite rule with regard to this may well be made at this time.

Rule: A circle in perspective becomes an ellipse whose major, or long diameter must lie perpendicular to the axis of the circle.

By axis is meant a line drawn through the center of the circle and in the same relation to the circumference as the shaft is to the rim of a pulley which revolves upon it. The rule holds good regardless of whether the ellipse lies in a horizontal, a vertical, or in an inclined position. Figure 9 illustrates several circles in perspective in various positions. In each of these circles, the long diameter and axis are shown perpendicular to each other.

One of the most important things to consider when drawing cylindrical objects is the proper width of the ellipses. One must consider the fact that when a cylinder is held with one end at eye level, this end shows as a straight line. Figure 10 shows a cylinder at various places above, at, and below the eye level. When the cylinder is lowered below the eye level, the straight line becomes an ellipse, very narrow at first but increasing in width as the distance below the eye increases.

It must be evident from this that an ellipse at the top of a cylinder, being nearer the level of the eye, will be narrower than the one at the lower end. This may be plainly seen in Figure 10.

There is also a very good method at hand by which it is possible to gauge the width of a perspective circle very accurately. On the horizonal line AB in Figure 11, step off the length CD of the ellipse to be drawn. Sketch vertical lines through these points and intersect them with a line drawn through the center of the ellipse and directed toward an assumed observation point O. Horizontal lines drawn through these points of intersection E and F will denote the width of ellipse to be used. The perspective center line of the circle lies slightly above the line of the long diameter.

Subdivision of Perspective Circles

It often becomes necessary for the teacher to make a drawing of a cylindrical object which must be divided into a certain number of equal spaces, a disc with a certain number of equally spaced holes, a wheel with four or six spokes, a ratchet wheel with almost any number of teeth, in fact, it is impossible even to begin to list all the possible cases.

Figures 12 and 13 illustrate two methods by which a perspective circle may be divided into a given number of equal parts. The first of these, while not a true perspective, is one which gives good results with any number of divisions in the circle and is simple to use on the blackboard. It is a projection method in which a circle is drawn on the same line as the axis of the ellipse. This circle is then divided into any number of spaces desired and each one is projected to the corresponding point of the ellipse. Thus, in Figure 12, we have drawn a perspective of a disc in which there are to be eight holes equally spaced at a certain distance from the center. The short diameter of the ellipse which is the axis of the disc is continued out to the left and on this line is drawn a circle for the outside diameter of the disc and another to indicate the circle on which the small holes are to be located. The circle is then divided into eight equal parts by lines drawn through the center and a small circle for the holes made at each point. The center of each of the small circles may then be projected to the ellipse representing the circular center line of the holes thus locating their perspective centers. If it is considered necessary the sides of the small circles may be projected also. It will then be very easy to draw in the small ellipses for each of the holes.

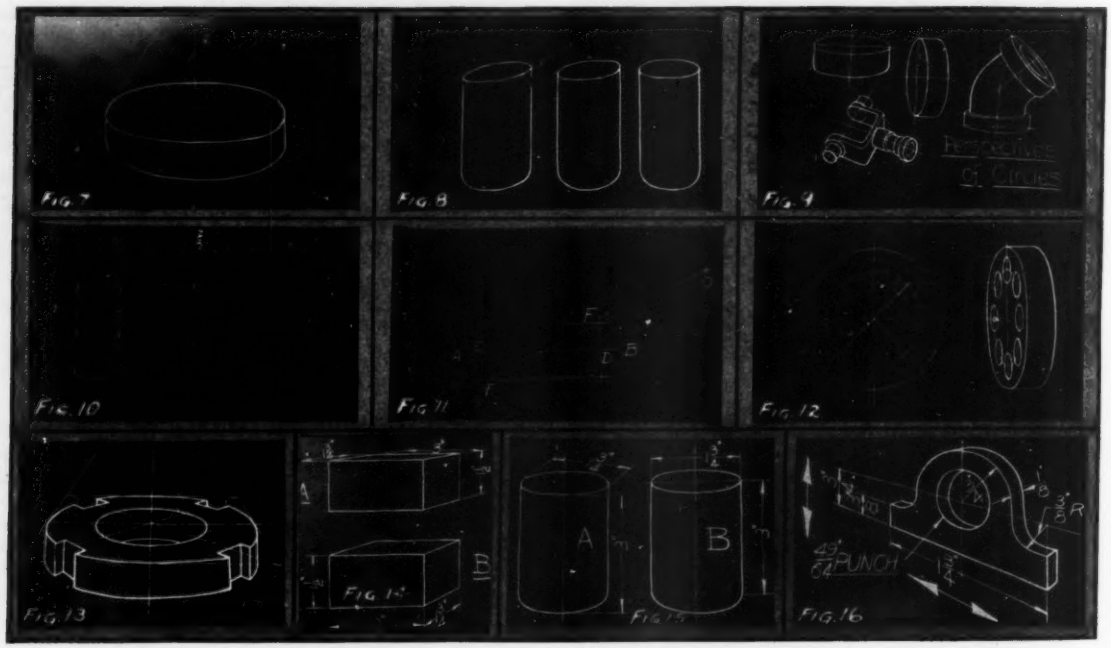
The method shown in Figure 13 is true in its perspective but can be used for four or eight divisions only. The diagonals of the circumscribed square give four divisions and the horizontal and vertical center lines give the other four. This method is simpler to use for the number of divisions stated and its use is recommended whenever possible.

Perspectives of Concentric Circles

When circles are to be drawn which are concentric on the object there is always a tendency to leave a uniform amount of space between the inner and outer ellipses. This must be given close attention because it makes the inner circle appear to be out of round. The length and width of the two or more ellipses should be proportional and the distance between them at the ends will be greater than at the middle in direct proportion to the length and width of the ellipses themselves.

Dimensioning of Perspective Drawings

In a great number of drawings to be made on the board in vocational and industrial-arts classes there will be a need for dimensions. Many a good perspective drawing is ruined by poor dimensioning, and many good working drawings are marred in the same way. In order to have a perspective drawing look well it becomes necessary to do the dimensioning in perspective also.



Compare Figures 14A and 14B. In the former the dimensions are placed in a manner considered good form for a working drawing, the figures are placed perpendicular to the dimension lines, the arrowheads are neat and the dimensions are correct as shown. Nevertheless, there is a feeling of broken harmony. In the latter the dimensions given are the same but the placement is such as to add to, rather than detract from the sense of perspective. Note that each of the dimensions now lie in the plane of the surface which it measures. The arrowheads are drawn with one side longer than the other also adding a little to the harmony of the drawing.

In dimensioning perspectives of cylindrical objects it will be found better practice to do so on the center lines as in Figure 15B rather than as shown in Figure 15A. The diameter of the circles also will be much easier to interpret as shown in Figure 15B than in the other.

Angular perspective offers still more possibilities for making or breaking the drawing than parallel perspective. Figure 16 illustrates a shim drawn in angular perspective and fully dimensioned. By the side of some of the dimensions are enlarged arrowheads to show how they should be shaped to add to the appearance of the drawing.

The numbers used for the dimensions on the drawings must also be made to their share in adding to the appearance. By themselves they would be considered distorted but in their place on the drawing they harmonize well.

Notes, such as indicate the size of a reamed hole, or the size and number of threads in a tapped hole, etc., may be placed outside of the drawing proper and a leader used to indicate where the note applies. Such notes need not follow the receding lines of the perspective, in fact, it will be better if they do not.

THE BULLETIN BOARD IN THE SHOP

George F. Billey, Valley City Public Schools, Valley City, N. Dak.

IS the bulletin board in the shop an asset to the teaching of industrial-arts work? The answer is, obviously, yes. Its value as a teaching factor has been overlooked by beginners in the work and by men already in the field. Perhaps one reason for the underestimation of its value is due to the fact that most of the results carried across to the pupils are unobserved by the instructor. There are other reasons, too. Many bulletin boards, for instance, never show a change in the material that is placed on them except for some announcements from time to time relative to some extraordinary school activity. A good bulletin board, however, should be interesting enough to attract the attention of the students from an educational viewpoint.

In most shops the instructor's time is so occupied with his daily work that often the finer phases of teaching are neglected. What better way is there of building up the character of boys than by the use of good literature on the bulletin board? Short selections of literature from good writers often leave a student a degree more determined to live his life in a better way than before. Good editorials can often be found that are of an educational type and yet are written so as to arouse the interest of the boys. Mottoes that are striking and easy to remember are a source of interest and attraction. A certain student can be delegated to bring a new motto for a certain week, and another the next, etc. There is much periodical literature that can be obtained which possesses much that is of interest to the boy who is taking manual training.

Descriptions, pictures, and diagrams on various phases and processes found in the manual-training work can be easily posted for the boys to read and look over. Often a student will not understand certain parts of the subject when it is given in the form of a lecture. A simple diagram, with appropriate explanatory notes will often help to clarify the subject matter in his mind, thus eliminating the time lost for individual instruction. Charts and pictures on the proper use of the various tools and machines can be obtained from supply houses or purchased from various publishing concerns. These form exceptionally good bulletin-board material. Some of these charts are in the form of job sheets and instruction sheets for classroom work.

Occasionally, the walls of a shop are crudely decorated with charts and pictures on various phases of manual training. This kind of decoration has its place, but usually this material is not observed by the students. A chart placed on the bulletin board, however, usually attracts attention because it is something new and it represents a change.

At times an instructor may, for the sake of variety, use articles on his bulletin board that are not directly related to manual training. Such items and articles may be found in magazines and newspapers that are in most of our school libraries.

The school paper, too, often furnishes articles for the bulletin board. In large school systems this tends to create unity among the student body. Interschool correspondence can be carried on between the manual-training departments of the various schools for the sake of widening the interest of the boys, and the letters may be posted on the bulletin board for those who are interested in them.

Perhaps one of the greatest benefits of a bulletin board is the vocational help that can be given to the students who are trying to decide what is to be their life's work. By this means, the student can be brought indirectly in contact with the occupations of the industrial field. Many boys are not even aware of the local possibilities of employment, to say nothing of the wider fields beyond the home locality.

To create interest, an instructor may put up notices of openings for available positions for graduates. What is a better incentive for a student to know that he is really preparing for a position, and to know that every day in school makes him more capable of carrying on in his chosen field of work.

In the making of projects in the shops, a student can better understand the object to be made if he has a visual concept of the project. Pictures, drawings, and blue prints of projects to be made can well be placed on the bulletin board for classroom work. Pictures of previous manual-training exhibits, or exhibits of other schools serve as an incentive for greater interest and effort. For this purpose, the snapshot can be made to serve a useful end.

The bulletin board also can be used for disciplinary purposes. A short direct appeal to the boys on shop behavior will often bring about a change in shop attitude. Along with all of the aforementioned suggestions, come the various announcements relative to special school and classroom activities. Special announcements, introduction of new courses, the assignments of lessons, etc., all of these can be placed on the bulletin board where they are in view of the entire class.

The bulletin board in the shop should be of good size. It should be well made, and well finished. It should be so placed that it will attract attention and yet will not interfere with classroom work.

It is to be remembered that the bulletin board must be kept alive by continually changing the display. If this is not done, the interest of the boys will not be sustained. It is surprising how a new article posted on the bulletin board attracts attention and interest; but more than that, it also creates respect for the instructor.

Trade Processes and Related Subjects

It is necessary to put over the idea that vocational education means more than teaching specific trade processes. Men must be made to see that related subjects as well should be studied. Society has a real obligation to employ men who are prepared to do a job well.—*F. T. Struck.*

The Greater Purpose of the Industrial Arts

There is need of a wider vision. There is too much of a tendency to shop for shop's sake and not enough for boy's sake. The great purpose of industrial arts is to teach certain important and significant elements in civilization—to represent the industrial and mechanical side of our civilization within the school border.—*Lewis Gustafson.*

INDUSTRIAL-ARTS MAGAZINE

EDITORS

E. J. Lake *J. J. Metz* *S. J. Vaughn*

SIMPLIFICATION

The Division of Simplified Practice of the Bureau of Standards, U. S. Department of Commerce, has been quietly working along toward the reduction and elimination of excessive varieties in the goods offered to the public. Studies and surveys are made, conferences held, recommendations rendered, which, when finally accepted, reduce haphazard sizes, varieties, shades, colors, items, types, models. The results benefit manufacturer, distributor, and consumer alike. The manufacturer makes and carries fewer parts. Anyone who is but slightly acquainted with manufacturing requirements, knows that that means fewer patterns, fewer jigs, fewer special tools; in other words, reduced costs.

For the distributor, the reduction in the number of sizes, or styles, or types means greater concentration of the sales effort on those that are offered. It means less diversified stock, and the more rapid turnover of the remaining sizes means greater profit. The consumer, too, benefits because the sizes once standardized are likely to be much more staple, and an order placed a year after the first shipment has been received, will probably be more nearly like the goods originally obtained than under conditions prevailing where there are a great many varieties and sizes of the same article offered.

This simplification and standardization in the industrial and commercial field has been going on for quite a while. The benefits thereof are quiet apparent. Would not the field of the industrial arts also benefit by a thoughtfully carried out scheme of simplification and standardization?

Take, for instance, the matter of terminology. Fred C. Ayers, in his research work, found that among the 618 supervisors in the various fields belonging to 44 cities, held 240 different titles. This means that men doing the same kind of work are known by different titles in different parts of the country.

In many cities manual training, industrial arts, manual arts, industrial training are synonymous terms. In others, they are not. In one state the industrial school is a reformatory for boys while in other states the industrial schools are pointed to with pride by educators and lay people alike, as the sources from whence come the future industrial workers.

In Wisconsin, the vocational school represents the same thing that the continuation school does in New York, Illinois, and other states, while in these states the term "vocational education" refers to quite a different type of education.

The engineering world gladly accepts the standards set up by such bodies as the A.S.M.E. (American Society of Mechanical Engineers) or the S.A.E. (Society of Automotive Engineers). Would it not be equally timely and advantageous for the teaching profession to finally bring the various attempts at standardization of the terminology which has grown up since the advent of manual training in this country to a successful close by having its authoritative bodies such as the A.V.A. and the N.E.A., lend their prestige and experience to this phase of the work to the end, that we, who are vitally interested in education, may finally all speak the same language?

THE UNIT INSTRUCTION SHEET

In an article entitled "How Good are Our Public Schools" by Helen Taft Manning in the July, 1928, issue of McCall's Magazine, she makes the following statement:

"It is not so much the goal of the schools whether that be preparation for college or for a trade, as the leisurely pace set in making for it, that is open to criticism. Slow minds and slow fingers have to be trained as well as nimble ones, and no doubt there are more of the former for the schools to handle. But as the slower pace is actually bad for the abler pupils in any subject, we shall have to come to some method of reclassification by which the better students can be pushed ahead. Already there are a few special classes for the 'backward' children. But we are less willing to recognize the exceptionally quick ones, in part, because they themselves soon learn and in time may actually prefer to travel at the slower pace. Our school system will never really meet the needs of the country until it searches out in every class the boys and girls who might be racing ahead, for they should be the ones to set the pace and fix the standard of achievement for their own generation. 'We must,' says Mr. Abraham Flexner of the General Education Board, 'have done with the idea that boys and girls will be mental prigs or physical wrecks if their superior endowment is utilized. Assuredly a nation of a hundred million will not make its proper contribution to civilization, unless excellence is esteemed and enabled to play its proper part.'"

Advanced thinkers in the industrial-arts field have long ago recognized the condition set forth in the foregoing. It was for the purpose of circumventing just such conditions that the unit instruction sheet was devised. By means of this teaching device it is hoped that the exceptionally fast student is aided in advancing faster or obtaining more out of a course than his slower-witted companions can accomplish. The rapid student is not tied down to a pace which is too slow for him. He is not given the opportunity of developing wrong habits of work because his rate of performing work are set not by his slower companions, but by his own ability and capacity.

On the other hand, the slowest student in the class is also entitled to the teacher's time. He really requires more explanation and help than does his quicker-witted classmate. Here too, the individual instruction sheet solves the problem, because the slow boy is never permitted to feel that he is the neglected member of the class. The same device which permits the fast student to advance as fast as he is able, permits the slow student to be fully occupied at all times in advancing at his own rate of speed.

The unit instruction sheet is not an invention of the industrial-arts field, but it is safe to say that the far-sighted leaders in this field have been more instrumental in perfecting this teaching device than any other agency.

Every enterprising industrial-arts teacher should earnestly study the use and preparation of this type of lesson because it will permit him to do his work more efficiently with a smaller expenditure of nervous energy.

TRAINING THE DRAFTSMAN

For the benefit of the new and inexperienced teacher, we are repeating our annual advice on mechanical drawing. Naturally the draftsman-teacher is impatient with the crude efforts of his beginners. So determined is he to have the first and second plates look neat and accurate that he often has the student waste a great deal of valuable time on them. It is not uncommon for the beginning student to spend days and days of laborious effort trying slowly and painfully to get his letters and figures to resemble those of the plate he is copying.

Reason and experience both teach that lettering for the draftsman is acquired by the same manner in which writing is acquired—not by slow, laborious platelike copying of a small sheet in a week, but by the careful and fairly rapid making of a number of copies. Such preliminary efforts should not be made to be preserved as specimens, but should be discarded until, with sufficient practice, a reasonably accurate plate can be

produced in a very short time. Facility in mechanical drawing and lettering comes with practice, and practice of the most helpful sort is repetition. No very great importance is to be attached to the very first plates a boy makes in mechanical drawing, except insofar as they represent careful effort, accurate observation, and industrious application. The beginning student can no more make a finished plate the first few lessons than he can write a perfect letter his first few weeks in school. All art is acquired by practice based upon accurate knowledge, and the finished product comes after numerous efforts made with reasonable speed leading up to the final accomplishment. The teacher of mechanical drawing should be much more concerned at first with the proper movement, the accurate observation of form, and the facility of execution, than he is with attempts to turn our good "plates" from the start.

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COPYRIGHT INFRINGEMENT ONCE MORE

Recently the INDUSTRIAL-ARTS MAGAZINE received the following anonymous letter:

"After reading several articles, especially the one on page 228 of your June, 1928, issue, in regard to copyright infringement, the writer wonders if it is safe for a teacher to *even* read your magazine."

The item referred to is a legal opinion given by an attorney on the question of the application of the copyright law to material taken out of textbooks by teachers for use in their classes. The writer of the anonymous letter need not be alarmed. The INDUSTRIAL-ARTS MAGAZINE is printed for the express purpose of assisting the teacher in his schoolwork. It was with this idea in mind that the publishers of this magazine arrived at the conclusion first of issuing blue-print supplements and still later the present form of tracing supplements, thus enabling the shop teacher to manifold the projects shown on the tracing for use in as many classes as he chooses.

Our sincere effort is to be of as much service to the teacher as is in our power. The ideas published in our magazine are for the teacher's use, and any use that he makes of them in his classroom merely fulfills the purpose for which we print the magazine. It is true, all of the material which appears in the magazine is copyrighted, but this is merely done to prevent its further use as publication material.

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THE TEACHER'S REWARD

Recently Alfred V. de Forest, research engineer for the American Chain Company was awarded an honor prize by the National Society for Testing Materials in recognition of his success in perfecting a new method of testing materials. In the past, the behavior of materials which were to be used in important engineering projects, was studied by testing samples of the given material to destruction. From the behavior of the test pieces, conclusions as to the strength and fitness of the entire mass of material, were arrived at. Mr. de Forest's method revolutionizes all this. He does not test samples, he tests the actual piece that is to be used for any particular purpose. After he has completed a test, the piece tested in still in the same condition as it was at the beginning. In other words, he does not destroy the material to find out its strength and its weaknesses.

The new test is based on a magnetic analysis. A tiny flaw in a large casting will be disclosed by the sensitive electric galvanometer which Mr. de Forest has devised. For years eminent engineers have worked on this problem, for years scientists have tried to develop just such a testing device. Probably Mr. de Forest himself spent years before the big idea, which later on proved successful, came to him. He has succeeded and richly deserves the acclaim of the engineering world.

No doubt Mr. de Forest's success is the reward of long, painstaking, and exacting effort. But the scientific basis which made this effort possible—was this not laid by his instructors at the Massachusetts Institute of Technology from which he graduated? Is not the fact that he was inoculated with the germ of the investigating habit, of painstaking research, of patient experimentation probably traceable to the first manual-training teacher who initiated him into the mysteries of how to handle the elementary woodworking tools in his grade-school years? Who can tell?

It is certainly true that the minds of future geniuses must receive the first impulse which sets in motion the mechanism of future achievement from some source, and is it not likely that this occurs in the school shop where the majority of boys are first initiated into the mysteries of science and tool manipulation? Is it not in the school shop where the boy's blind ambition to make something is led into proper channels so that that something becomes a reality?

The industrial-arts teacher has a great opportunity and in most cases is making the most of it too. It is not idle boasting if credit is taken by the school shop and the school-shop teacher for the stupendous advances which have been made in the mechanical, electrical and chemical sciences.

This realization should make the teachers of industrial arts and the sciences justly proud, but it should also make them cognizant of the great privilege and the greater responsibility which their office places on their shoulders.

Verily, the duties and responsibilities of the teacher are great, but their reward in the shape of successes garnered by their erstwhile students is also exceedingly great.

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IS YOUR AIM DRAFTSMANSHIP?

One criticism of our mechanical-drawing courses is that we aim to train for draftsmanship. This criticism is justified, to a greater or less extent. For evidence, we need look no further than the advertisements on some of our high-school texts or at the preface in some of these same books. For example, one such advertisement reads thus: "The author of this text spent fifteen years in engineering drawing rooms and has taught this subject for ten years. He is peculiarly fitted to arrange a book to satisfy the demands of the commercial drafting room."

Practical drafting experience is a valuable asset in writing a successful text on this subject, but to consider that our school drafting rooms are, primarily, training grounds for commercial draftsmen is stretching the imagination and admitting an ignorance of what the true purpose of such a course should be.

The great majority of the students studying this subject will perhaps never work in a commercial drafting room, but yet may sooner or later be called upon to make simple free-hand sketches, or to interpret ideas which have been graphically represented. Our method of approach in teaching, therefore, must be influenced by the possible future lives of our students.

The resourceful teacher realizes the possibilities of this language for the probable lawyer as well as for the probable machinist. It is possible that neither will be called upon to make an instrumental drawing, but the lawyer might have occassion to sketch the intersection of two streets showing the exact location of two cars at the time of an automobile accident; while the machinist will surely be called upon to interpret drawings made by others.

The exact provision made in many of our schools to recognize the principle of democracy in arranging their courses might be seriously questioned. It is not so important that the majority of our students learn to make a neat instrumental drawing to scale, but that they learn to use a language which finds application in almost every walk of life.

COMMON FAULTS IN MANUAL-TRAINING ROOMS

C. M. Gilmore, Director of Manual Arts, Hazard High School, Hazard, Ky.

THERE are no manual-training departments that are absolutely faultless. Many of the existing faults can and should be remedied; some are beyond correction.

General Appearance

There are numerous manual-training departments that are unimpressive because of their general appearance. This is a mistake that can, in most cases, be overcome. There is no good reason why the manual-training department should not offer an inviting and pleasant environment for the pupils to work in. Pupils will not cherish the proper amount of respect for manual training if it is presented in surroundings characterized by unattractiveness, lack of comfort, crowded conditions, and inconveniences. The walls and ceiling should be painted or at least kalsomined. The color that reflects light best is light green. The woodwork should be stained or painted in harmony with the walls and ceiling. If the floor is concrete, it should be given several coats of paint that is adapted to concrete, in order to reduce the dust that rises from unpainted concrete floors. Each of the rooms of the department should be kept clean and orderly. There is no excuse for any undue accumulation of dust or cobwebs. Lumber, supplies, and tools should be stored in accessible places, and they should be kept properly arranged. The windows are to be kept clean. Finished projects appear best when they are attractively exhibited. The workbenches should be kept orderly and well preserved, and the machines are to be kept free of dust and in good repair. All scrap material should be properly disposed of. The janitor's supplies do not belong in the manual-training department. Avoid an excessive accumulation of broken chairs or other damaged school furniture waiting for repairs. Everything that will in any way enhance the general appearance of the manual-training department should be done; every item that detracts from the general appearance should be eliminated.

Care of Equipment

The tools, workbenches, machines, and other articles of equipment in many manual-training departments show lack of proper care. The saws are dull and out of set, the planes have lost their keenness, the blades of the try-squares are rusty, the screw drivers are blunt, the workbenches are hacked and sawed and otherwise marred, the machines are out of adjustment, the finishing room is sadly besmeared, the brushes are old and dirty, the blades of the T squares in the drawing room are loose, the triangles are not true, the drawing boards are dirty, and there are many other evidences which show that the equipment is not properly cared for.

One of the greatest benefits that the manual-training department can transmit to its pupils, is a definite understanding of how tools and other articles of equipment should be cared for. To succeed with this, is by no means an easy task. Pupils are inclined to follow the lines of least resistance, and unless the instructor is persistent and supervises the equipment closely, it will not receive the proper care. To be negligent in this particular, is certainly a grave mistake that should be avoided.

Definite Objectives

So many manual-training departments are indefinite with reference to their objectives. The idea is somewhat prevalent that to make a lot of projects without reference to proper sequence, degrees of difficulty in execution, tool processes, and to repair a lot of school furniture which has been carelessly broken; build cabinets here and there about the school; make tables for the cafeteria and the kindergarten; and do a multitude of other repair jobs, constitutes manual training in the strictest sense. This sort of manual training is floundering and haphazard and does not give the pupils the training which they would receive from a course of study definitely planned and definitely carried out. Every manual-training department should follow a carefully prepared course of procedure, which leads to definite objectives such as skill in tool manipulation, proper wood finishing, care of equipment, originality in design, appreciation for projects well made, pride in work, and a keen sense for orderly shop arrangement. Certain school jobs, such as making tables, may be undertaken with profit by pupils doing community or group work, but the manual-training department should not attempt to do all of the carpentry jobs which arise in the school and on the premises. Too much of this outside work robs the department of the time that should be devoted to the regular course of study and it adds very little to the training of the pupils. More of this kind of work can be taken care of if there is a class pursuing a course in carpentry, but even a carpentry class should have a definite course to pursue, and too much time should not be given to routine repairwork. It is better that the class in carpentry concentrate its efforts upon a single job, such as building a garage, than to undertake a lot of smaller jobs. It is certainly imperative that the manual-training department have a well-planned course of study which leads to well-defined objectives.

Housing Quarters

Many manual-training departments are housed in rooms unsuitable for manual-training purposes. The idea is somewhat prevalent that any unoccupied rooms will do for this department. This is certainly a wrong conception. The manual-training department should have quarters which have been specially planned for it. There should be a room for the workers at the benches, a toolroom, a finishing room, a washroom, a stock and cutting room, a demonstration room, and a room for the drawing department. In the larger manual-training departments where sheet metal, printing, wood turning, machine shop, millwork and other subjects are presented as special courses, additional rooms are required. The different rooms, whether the manual-training department is large, medium, or small, should be conveniently located with reference to each other. The cutting room and benchroom should be conveniently located with respect to each other. The mechanical-drawing room should not be too near nor yet too far from the benchroom and sheet-metal room. The element of convenience should be carefully considered when the room arrangement of the department is being planned.

Unsuitable quarters are usually accompanied by other bad features besides improper room arrangement. Almost invariably there is a deficiency of light. This is a serious mistake, because the manual-training department needs an abundance of light. Certain types of manual-training work, such as inlaying and making dovetail joints, require more light than others. The main source of light should reach the workers over their left shoulders. There also should be ample electric lighting for the dark days. The electric lights should have white bowls to soften the light and eliminate the glare.

Crowded conditions are usually found in manual-training departments that are housed in unsuitable quarters. The workbenches are frequently placed back to back for lack of space. The machines are often located so close together that there is interference when they are being used. Crowded conditions hinder the department in doing the best work that can be done. In addition to this, the ventilation is usually deficient

and the element of convenience in shop arrangement is naturally lost sight of. Crowded conditions constitute a mistake that should be eliminated when possible.

The troubles that arise because of unsuitable quarters for the manual-training department, are not always easily overcome. Time and patience are required, and in some cases the school board and the superintendent will have to be enlightened as to the needs of an efficient manual-training department. However, whatever is required should be done, because the manual-training department is deserving of appropriate and well-planned quarters.

The foregoing list of faults does not, in any sense, constitute an exhaustive list. Those that have been discussed may possibly suggest other faults that must be eradicated so that more efficiency may obtain. All manual-training departments should be as near 100 per cent efficient as it is possible, and the elimination of all possible faults will very materially assist in raising the efficiency.

ADMINISTRATION AND SUPERVISION OF A VOCATIONAL DEPARTMENT

E. C. Savage, Lincoln Junior High School, Santa Monica, California

THE following is an outline of the duties of the administrative and supervisory staff of a vocational department. Some of the subheads may be expanded into more detail, but the information given will serve the purpose in most cases. While it is intended primarily for a vocational department, it will apply equally well in other school departments, academic or otherwise.

1. It may be used as a measuring stick of efficiency of those who are at present working in the capacity of administrator or supervisor of such a department.

2. It may be used as an outline of duties for a person who is elected to direct or supervise a department.

3. It is an outline of information for executives and members of boards of education, showing what they may expect from one in charge.

DUTIES OF THE DIRECTOR OR SUPERVISOR OF A VOCATIONAL DEPARTMENT

Make Surveys
1. Schools
   a) Extent of work in other schools
2. Community (Local)
   a) Extent of men and women in specific industries
   b) Number needing vocational education
   c) Demand of industries for courses
   d) Need for additional lines of work
3. Other Communities (Same as Local)

Hold Teachers' Meetings
1. Improve Teachers
   a) Discuss individual problems
   b) Instruction and lecture to all
2. Improve Courses and Curriculum
   a) Discuss own courses
   b) Suggestions for improvement and expansion

Visit Schools
1. Inspection

Measure Teacher Efficiency
1. Tests
2. Observation
3. Results Obtained

Make Budgets
1. Capital
2. Maintenance and Repair
3. Operation

Coordinate
1. Educational Salesmanship
2. Promoting Instruction
3. Placement and Follow-up
4. Personal Advice and Assistance
5. Community Cooperation

Vocational Guidance
1. All Teachers
2. Selected Teachers in Buildings
   a) Vocational information in subject teaching
   b) General information to special classes
   c) General information to all students

Direct Vocational Work of Community in Schools in General Policy

Give Vocational Information Directly
1. Demand for Types of Workers
2. Desirability
   a) Wages
   b) Hours
   c) Employment
   d) Working conditions
   e) Permanency of employee

Determine Essentials
1. Development
2. Organization
   a) Expenditure
   b) Capital
   c) Available buildings
   d) Equipment
3. Administration

Present Definite Information to Board of Education
1. Increased Room Needed
   a) Existing buildings
   b) Rental
   c) Remodeling
   d) New buildings
2. Increased Operation and Maintenance Equipment
   a) Same as for room
   b) Firms handling
   c) Best adapted to school use
   d) Costs
   e) Time needed for purchase and installation

Direct Attention and Interest of Board
1. Present Importance of Vocational Education
   a) To pupils
   b) To community

Develop and Direct Community Sentiment on Vocational Education
1. Present Importance of Vocational Education to Community
2. Create Public Sentiment
3. Interest Employers of Community
4. Interest Labor Leaders
5. Use of Local Press
6. Keep in Harmony with Working People

Continually Look for Improvements
1. Organize Courses
   a) New courses
   b) Courses already in
2. Reorganize Material in
   a) Within courses
3. Reorganize Methods
   a) Teaching
   b) Supervision
4. Wiser Selection of Instructor's Material
   a) Courses—Industries represented
   b) Lessons—Units represented
   c) Equipment—Modern or better adapted
5. Better Coordination
   a) Result of experience at school—at school shop—in industry
   b) Result of more intelligent help from industry
6. Greater Effectiveness
   a) Students served
   b) Community served

Submit Definite Recommendations For
1. Increasing Scope of Work
   a) Expansion within courses
   b) Expansion into new courses
   c) Elimination of course
2. Increasing Effectiveness of Work

Command Respect of Board
1. Continual Observation of Department
2. Definite Information
3. Definite Recommendations
4. Convince Need for Expenditures

Be Effective Worker in One Trade
1. Direct Work in All Lines
   a) Trade analyses
   b) Supervision and inspection devices
   c) Gain cooperation of teachers
   d) Fix responsibility

Select and Recommend to Superintendent or Board of Education
1. New Teachers
2. Teachers in Service

Express Himself Clearly and Convincingly on Vocational Problems
1. To Fellow Directors, Teachers, Superintendent and Board of Education, People of Industry, and Leaders in Industry

Make Trade Analyses
1. See Sample Analysis
2. Have Teacher Make Analysis
3. Have Teacher Help
4. Organize Course on Result of Analysis

Deal With Teachers
1. What is Taught
   a) Needs of pupil
   b) Present attainments
   c) Time for instruction
   d) Equipment and facilities
2. Observe
   a) Methods of teaching
      1. What is done
      2. Order of doing
      3. Class instruction
      4. Individual instruction
   b) Results obtained
      1. Student graduates
      2. Student products
      3. Opinion of employers
3. Demonstrate How to Teach
   a) What is to be done
   b) Order of doing
   c) Psychological analysis and application
4. Secure Cooperation and Improvement of Teachers
   a) Suggestions carefully thought out
   b) Sympathetic attitude

Clerical (Done by Clerks)
1. Records and Reports
   a) State
      1. Attendance
      2. Financial
   b) Local
      1. Grades
      2. Individual characteristics
   c) Others
      1. Of positive value to division of vocational education
      2. Only necessary ones. Problems

Provide for Research
1. Studies
2. Investigations
3. Experimental Work

Instructional Advertising
1. Conversation
2. Lectures
3. Articles for Publication

Establish and Maintain Effective Working Relations
1. Schools
2. Other Departments
3. Outside Organizations

Keep Informed
1. Legal Measures
2. Professional Standing
3. New Developments

STARTING A CLASS OF BEGINNERS

L. J. Cantrell, Macfarland Junior High School, Washington, D. C.

THERE is a certain minimum of information which a pupil upon entering a shop for the first time should acquire before he is permitted to begin work with tools. It has been my observation that teachers have a tendency to err on the side of too much instruction for beginners rather than too little. Not long ago, the writer observed a teacher who carried his beginners' class through a discussion which began with the names and uses of all the tools in the shop, then plunges into an explanation of the difference between the ripsaw and crosscut saw, and finished up with an exposition of how to lay out and square up rough stock. Then he plunged into a very detailed and lengthy explanation on the general process of "truing up" stock. At the end of the period of ninety minutes the instructor was still going strong but that portion of the class which had not been kept on the alert warding off jabs from sharp ends of pencils and divider points thrust at them by other members of the class, had long since slumped into an attitude which would lead one to believe they were attempting to imitate that noted character in literature who slept for twenty years.

To the shop instructor who has had several years' experience and to whom the process of teaching has become almost second nature, a class of beginners represents, in some respects, the most dangerous stage in his teaching. One of the greatest dangers from the standpoint of pedagogy, it seems, is the tendency of the teacher to take it for granted that the class is already more or less familiar with the names of tools and terms which he uses. As a result, he enters, as did the teacher referred to above, into such a discussion of processes and proper technic of tools that the pupils are lost in a maze.

It appears that as soon as the preliminary remarks are made regarding the use and care of the tools which the pupil will use immediately, and just enough said about the first project to give the pupil a clear understanding as to what is expected of him, he should be permitted to proceed with the use of the tools, a thing which he has so long desired to do. The knowledge which is required of a beginner should be such that he will be able to grasp it before his interest in the actual construction wanes. There is no better way in which to destroy the enthusiasm of a class than to subject it to a long-drawn-out discussion of the things which are not of immediate value. Such procedure is also wasteful because the child retains such a small percentage of what is offered.

It is not my purpose to convey the impression that the pupil should be permitted to begin work without proper instruction and without a definite understanding of what is expected of him, or without having had a demonstration of the proper use of the tools. Just how far this preliminary instruction should be carried will be determined largely by each individual class. But the discussion or demonstration should never take up so much time that the pupils are not given an opportunity to "feel" of the planes and actually make a few shavings. Their awkwardness will convince them far more conclusively than any argument that the teacher might put forth, that they really need to be shown how. They find that the plane in the hands of the instructor works perfectly, and the board remains in place on the workbench, but when they attempt the same thing, the plane becomes stubborn and the board, becoming animated with life, refuses absolutely to stay put.

The following lesson plan has been used with beginners with a considerable degree of success:

The class is given instruction upon entering as to the places they are to take in the room. The writer has pupils seated on the end of their workbenches away from the tool rack facing the instructor. This puts each pupil in a comfortable position and removes the temptation to move about, fumble the tools, and otherwise create disturbances. It also tends to create in the mind of the pupil the idea that the shop, after all, is really a classroom, where orderliness and quiet (except that which is incident to their work) must be maintained the same as in their academic classrooms. This position is taken by each pupil upon entering the shop throughout the school year. This gives the teacher an opportunity to get his

pupils under control while explanations, notes, and demonstrations may be given. The writer has had some criticism of this practice because of the "waste" of time, but when we take into consideration that the purpose of the course is largely to train boys to become useful citizens, to take their place in the world in which they live, and not to turn out projects in quantity production, it seems that time used in this manner is well spent.

When all have been seated, a few words have been said about shop rules, or better, what is expected of them in the way of conduct and behavior, they are told what the jack plane is, how to care for it, and are shown how to use it. The names of the parts of the try-square and a demonstration as to the proper way of holding it when testing stock is all that need be said about this tool at this time. When this is done, each pupil is handed a piece of softwood. The writer prefers that the sides be not surfaced so the pupil can see the transformation which can be wrought on a board with a jack plane. He is shown the proper way in which this stock should be placed in the vise or on the workbench. Then he is told that he is expected to get one side smooth and true. The writer has found it is a good policy to have a piece of the same stock planed smooth and true on one side so they can see the standard they are to strive for.

When work begins, problems come up thick and fast. One boy's plane will cut too deep, another's will not cut at all. The whole class should give attention to each problem when it first comes up, as all are willing to listen and learn about the tool which they are using. This is the time when they can be shown the purpose of the main parts of the plane. Interruptions should not be made for more than two or three minutes at a time, as the interest of the pupils is centered in the use of the tools and not in any detailed discourse of the use of the various parts except as such explanation will meet the requirements of their immediate needs.

To some this may seem to be very little instruction to be given to a class in ninety minutes, but when we sum up the information which the beginner is expected to grasp, all will agree that it is quite enough for a pupil just beginning his shopwork in strange and unfamiliar surroundings. Let us take stock of what has been given the pupil.

1. He has been assigned to a bench and knows the seating arrangement.
2. He has learned the name of the jack plane and of the try-square.
3. He has become acquainted with the names of several parts of the plane, such as the handle, the blade, the knob, the lateral adjustment lever, the "Y" lever. He also must remember how to manipulate the last two.
4. He has been shown the try-square, told what the handle and blade are, and has actually used it in testing the surface of the stock which has been given to him.
5. He has witnessed a demonstration of how to use the jack plane, and has learned that he is to press down on the knob (toe) of the plane on starting the cut and to gradually shift the weight to the handle (heel) of the plane as the stroke proceeds.
6. He has been shown how to clamp the stock in the vise with the grain away from him so the cut will be smooth and even.
7. He has been given the opportunity to actually use two of the tools most common to the shop, and, incidentally, has come in contact with some of the difficulties which confront him in his work.
8. He has been shown how to hold the try-square on the surface of the wood to test its smoothness.
9. And last, but not least, he has been given an opportunity to use the jack plane as a cutting tool.

If a good beginning has been made in the above points, the teacher may content himself with a period well spent.

CREATING INCENTIVES IN MECHANICAL DRAWING

C. A. Rosell, Indianapolis, Indiana

MECHANICAL drawing is usually interesting enough to hold the attention of most beginners, but it does happen at times that interest will lag in some beginning class. It is well to check this lag in interest at the earliest possible moment. Even though everything seems to be progressing nicely, some little variation in the way of creating interest or the presenting of an incentive toward some goal is often a great help in achieving desirable ends. All too often, the teacher overlooks simple means for checking lag in interest or methods of sustaining or creating interest. The methods suggested in this article are not of the type that will consume a great deal of the teacher's time, but even if they did, the results obtained and the enjoyment that the teacher gets out of observing the reactions of the individual members of the class are more than ample reward for the time and effort expended. These devices or methods are no doubt used by many teachers every day, but for the new teacher or for those who have reached the place where they take their subject too much for granted, this article may be of some help or inspiration.

When the members of a class are slowing up, the following scheme may be tried for a period of two weeks or more. It is customary in my class to make a sketch of each problem in working-drawing form before making the mechanical drawing. When the sketch is started, the students are asked to note the time, and they also note the time upon completion of the sketch. They then compute the time required to make it. The same process is followed when making the mechanical drawing. Thus, within a short period of time they have established for themselves a fairly definite idea of how much time they need to make a sketch or a mechanical drawing, making allowances for differences in difficulty of solving various problems.

The object of this scheme is not to see how quickly the sketch or the drawing can be made at the expense of the quality of the drawing being done at that particular time, but rather to eliminate the wasting of too much time due to lack of concentration. There will be a tendency on the part of some pupils to do poorer work for the sake of speeding up the making of a drawing. This tendency will have to be checked just as poor quality of work under other circumstances has to be dealt with. On the whole, however, the pupils use their time to good advantage with the foregoing scheme in operation. The spirit of competition which enters tends to make their work more interesting, although no great emphasis is accorded the fact that a certain individual can do a piece of work in a specified time. Usually, however, the boys check time among themselves, and they show considerable pride when they can inform the teacher that a certain drawing was completed in a very brief space of time.

The varying abilities of the members of a class would prohibit excessive emphasis on the establishment of a very definite time limit for the completion of a sketch or a drawing. The main purpose of the scheme is to get everyone to work up to his maximum possibilities. Once they find that they

can make a drawing in a certain length of time they have a check on themselves, and if they slow up they can be shown that they are not coming up to their previous record. Most pupils enjoy the spirit of this scheme as much as the teacher enjoys the results it brings.

After they have followed the foregoing scheme for a number of weeks, the following device might be tried for the sake of variety. Put this question to the boys: "How many sketches or drawings do you think you can make within the next two weeks, or any other specified period?" From past experiences, each individual knows approximately how much time it takes him to complete a sketch or a drawing. He can, therefore, make an estimate of his ability to do a certain amount of work in the specified time. The students are usually inclined to overestimate the amount of work which they can accomplish, but there is no particular harm in that. If anything, it spurs them to reach the goal they have set, and there is no disgrace attached to failing by a short margin of reaching that goal. Usually, the students enter into the spirit of this kind of scheme quite enthusiastically and seriously. One boy put it this way in getting his next assignment after having been absent one day, "May I make one of the drawings at home? I have a contract with you for six drawings and I was absent yesterday."

Thus far, little has been said about the quality of the work. Most of the boys take pride in turning out neat drawings, and all too often they feel that the looks of the drawing is the only criterion on which their grade should be based whether they are good at solving the problem, or visualizing the object, or not. The feeling that this drawing will get me a passing grade is, of course, also characteristic of many of the pupils and they do not strive to better each drawing. In order to create competition and pride in the ability to do good work, each individual is urged to do the highest grade of work possible by being assured that his work will be displayed in the room if he can execute an A-plus drawing. If the pupil cannot do A-plus work, he is assured that one of his A drawings will be exhibited. The announcement concerning A drawings is not made until everyone has had a chance to get into the A-plus class and no A drawings are exhibited until the A-plus exhibit period is over. This also adds to the bettering of each individual's work, for he is asked to notice what there is about the drawings displayed that makes them good ones. The boys usually stop to look at the drawings and sketches as they enter and leave the room. It is no doubt partly out of curiosity to see whether their friend has made an A-plus drawing, but nevertheless, it spurs the individual to do better work.

In order to create an interest in ability to solve problems, the following scheme may be tried: Once or twice a week an incompleted problem is sketched on the blackboard. The students are then asked to make a sketch of their solution of the same. They are timed to see how rapidly they can solve it. The grading is not done on the quality of the work, although the sketch must be well proportioned, but on the time required for solving the problem. This can be done by marking the time required to solve the problem on the papers as the student hands it in. When, later on, the problem is discussed by the class, the time element is also taken up. Of course, it is usually the good student who completes his problem in the shortest length of time except where a good student is overparticular about the neatness of the sketch.

The foregoing devices are all for the purpose of creating incentives to do some particular thing in a more satisfactory manner and by concentrating on one goal at a time, more can be accomplished. It is, of course, hoped that speed of execution will continue after the special period set for the speed test is over, and that in a similar way, the other qualities also will persist throughout a student's drawing-room career. The happy thing about these experiments is that they have a tendency to accomplish this in most cases.

THE CARE OF TOOLS IN THE SCHOOL SHOP

James A. Hoskins, Director of Industrial Arts, Fort Collins, Colorado

EVERY school that has an industrial-arts department is confronted with the problem of taking care of tools and supplies. By "industrial arts" we mean all shop subjects that are taught in the public schools. The problem of caring for the tools is very important, since most school boards judge the efficiency of the department and the teacher by the cost of the upkeep. If the instructor hopes to get the most for his department, he must show a very small loss and a very good organization for caring for new equipment. This organization must provide for differences in shops, methods for keeping tools in the proper place when not in use, and the repair of tools.

In order to accomplish such an organization, we must have a definite plan of organization for woodwork, sheet metal, machine, automotive, and general shops, also the mechanical-drawing rooms. These methods will vary with each shop, since their tools vary.

In our woodwork shops we find the instructor acting as toolroom man and having everything where it is accessible. He checks up the tools at the beginning and at the end of each class. How many provide for protection of tools outside of the class period? What is to hinder the loss of tools?

While the instructor is checking up his tools, he is not teaching and, in a great many instances, the boys are not working. If he checks out the individual tools to the boys the first day, and lockers are provided for them, this item will be dispensed with for the entire term. This shifts the responsibility to the student for keeping the tools sharp. He not only learns to sharpen his chisel or plane iron, because it is a part of the course, but it is needed in his work, and a poorly sharpened tool does poor work. The names of the general and special tools are seldom learned, as the boy passes to the rack and takes the tools he needs. Many times the instructor demonstrates a tool and says: "Use this mortising chisel in making a ⅜-in. mortise." The boy forgets the name but remembers the chisel. On the other hand, when he gets it from the toolroom, he must ask for the ⅜-in. mortising chisel.

In the sheet-metal shop, conditions are a little different, as there are fewer individual tools, fewer tools easily dulled, and more general tools. Most of the work is done on machines, as in the industrial shop. The small number of tools and machines enables the student to become familiar with their names.

In the automotive, general, and machine shop we find a great many special and general tools. These are the shops where the greatest losses take place, as the tools are not always checked up and the responsibility is not placed on the user. In these shops a toolroom will work best, for it enables the instructor to check up on his special tools, such as socket, adjustable, and special wrenches. He will also know where and when his supplies are being used.

In general, we have three classes of tool conditions for which to care. The first of these classes is the shop with a comparatively small number of tools, as in the woodwork, blacksmith, and sheet-metal shops. The second class is the shop with many special and general tools, as the machine, automotive, and general shops. The third class is the shop with very few tools, except those checked out for all of the term or owned by the student, as in the drawing rooms.

The organization in the first two should be about the same. A corner of the shop should be partitioned off, or a small room adjacent to the shop be fitted up to care for the tools and supplies. The best arrangement is one in which every tool has a place and in which they are arranged so that the tools used the most are placed in easy reach of the toolroom attendant. A large board, on one side of the room, is fitted with hooks on which to hang the tools. An outline of each tool should be painted on the board to facilitate replacing tools. There should be a cupboard with a number of drawers for nails, screws, bolts, cotter pins, or other small supplies. There should be a number of larger drawers in which to keep larger supplies or tools. The upper part of this cupboard should be provided with shelves about 10 in. apart. Unopened boxes of supplies, new tools, large tools, tools in sets, and books are kept on these shelves. Bins or tiers of shelves are always handy, but drawers look much neater. It is better to plan more toolroom space and more drawers than is needed at the time the toolroom is organized. Each toolroom should have a definite inventory placed on a card-index system, which will show the exact location, length of service, and make of every tool in the shop. This inventory has many uses. It enables the toolroom man quickly to locate any tool. The instructor is able to judge the wearing qualities of the various makes of tools, and thus be guided in future purchases. It enables an inventory to be taken quickly and accurately at any time. A small nail is placed in each drawer, bin, and beside each hook for tools on the board for the student's check while he has the tool out.

A member of the class is placed in charge of this toolroom for a definite length of time. In the writer's classes, the number of students is divided into the number of days of shopwork. This will give the number of days each boy will be in charge of the toolroom. Some may say that this is a waste of the boy's time. If the instructor understands organization, this training is valuable and will not keep the boy from his regular work. If few tools are checked out, the boy may work on his problems in the toolroom. In some cases the toolroom must be a distinct problem. The toolroom man has more to learn in a given length of time than he has on any other problem. He must first learn the names of the various tools. This he accomplishes best if it is insisted upon that tools are always called for by their proper names. He must also learn how to repair and sharpen tools.

In drawing rooms, it is not necessary to have a toolroom, since the instruments are checked out to the students for the entire semester. Each student merely signs a card, indicating that he has received his tools, and this is filed by the instructor.

When the toolroom man first goes into the toolroom he signs the toolroom register which invoices all tools and thus assumes responsibility for them while he is in the toolroom.

The following list of toolroom rules will clearly show how the responsibility is placed on the toolroom man:

At the Beginning of the Period

1. Before you open the window, check the tools on the tool racks. See that every tool is in its place. Open the window when the assembly bell rings.
2. Check all of the tools in the tool cabinet.
3. Make a written report using the following form:

Name..... Date.....
Checks on hand..... Numbers in the drawers.....
....
Tools missing.....
(File this report in the desk drawer)

4. You are to have charge of the toolroom for five successive periods. Your work must be satisfactory to entitle you to a passing grade, and your grade will depend upon the efficiency of your work. Any suggestion that you offer for the improvement of the toolroom, will, if adopted, be considered in your grade.

During the Period

1. Keep the door locked and do not allow anyone to enter.
2. Issue tools to persons in your section, and to members of the department upon receipt of signed slip. Place the checks upon the racks or in the drawers so as to show exactly which tool was issued.
3. Issue tools to others, only, when a printed blank has been properly filled out and signed by the instructor. File the receipt the same as you would a check.
4. Do not issue any stock or material from the supply cabinet unless you have an order from the instructor.
5. Look over the room in general, and put everything in good order. Sweep the floor, ventilate and dust the room, straighten up the stock, carry out any special instructions or duties for the day.
6. About fifteen minutes before the close of your last period call in your successor and instruct him in his duties. Do not fail to show him this instruction card and the register.

At the Close of the Period

1. Look over the tool boards and drawers to see that all tools issued have been returned to the proper places and that no checks remain on the board.
2. Close the toolroom window and lock it. See that the outside windows are closed and locked.

The distribution of tools may be handled in one of two ways: by the check system or by the card system. The check system is the most common. Four or five metal checks are issued to each student. These checks will have the same number. When a student wants a tool, he goes to the toolroom window and asks for the tool and gives a check in return for it. The toolroom man hangs the check on the nail beside the place where the tool belongs. When the student returns the tool, he receives his check. If he does not return the tool, the toolroom man reports it to the instructor, who, in turn, asks the student about the tool. If it cannot be found, the instructor charges the student for the tool, and his check is returned to him. When a tool is broken, the student must get a repair slip from the instructor. The following is a good form:

Shop Note

Name..... Date.....
Repairs needed.....
Charge.....
.....
Instructor

This will enable the student to get his check and clear his record with the toolroom. When the tool is returned with a repair slip, the toolroom man makes such repairs as fixing drop cords, sharpening chisels, and grinding points on punches. If the tool needs welding, or special sharpening, or new parts, the instructor either sends it out or repairs it himself. In either case the student is charged for parts and labor.

The other method, the card or charge slip, is used in various forms. This method requires the student to fill out a slip and sign it. This is presented to the toolroom man, who files it and gives the student the tool. Two of the various forms are shown herewith:

Form 1	Form 2
Date.....	Date.....
Tools received: .... Signed.....	Received the following tools in good order and to be returned before the end of this laboratory period. .... Signature (If list is long, use back of card.) (See printed blank inclosed No. 1.)

When the tools are all turned in at once, the slip is returned to the student. If they are not all returned at once, those returned are scratched from the slip. When all are in, the slip is the student's receipt. By this method the boy will be very careful to pick up all of his tools before he leaves a job.

With a man in charge of the toolroom, the instructor will have more time to devote to instruction. He will not have to be thinking about the care and distribution of tools. If he is giving individual instruction, he will not be interrupted by boys asking for various tools. The toolroom man is really an assistant who looks after the details and reports irregularities to the instructor.

The school that has a well-organized toolroom will have a better industrial-arts department and turn out more work. This is due to: first, the equipment and tools will be in better shape and always in place. Second, tools will last longer, since they receive better care and are always kept in repair. Third, the instructor will have more time for individual help, as he will not have to devote so much time looking after tools. A systematic toolroom in any shop is not only desirable but taking care of the toolroom is part of the essential training that all boys need and will use in their future work.

EXAMPLE OF AMERICAN COLONIAL PEWTER AT THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY

FOR THE CABINETMAKER'S NOTEBOOK

W. G. Hjerstedt, Roosevelt High School, Chicago, Illinois

ADAM, ROBERT AND JAMES. Robert and James Adam were celebrated architects and designers who influenced the fashions in household furnishings and interior decoration to such an extent, that a style of furniture has since developed, which bears their name. Robert Adam, the older of the two brothers, studied in Italy. He was greatly influenced by the Italian artist, Piranesi, and is said to have based his style upon the ideas of this great artist.

Although the Adam brothers never built a single piece of furniture, they designed and supervised its construction, and thereby instituted an English style which is decidedly classic. Not being craftsmen themselves, they undoubtedly commissioned other great designers, as Chippendale and Hepplewhite, and perhaps Sheraton, to execute their plans. Adam furniture designs were similar to Sheraton's and Hepplewhite's, but more classic in style, being based on a study and revival of antique details found in the buried cities of Pompeii and Herculaneum.

The greatest contribution of the Adam brothers to the art of furnishing was their insistence that the furniture should harmonize with the surroundings in which it is placed. Unfortunately, the conditions they sought to overcome still prevail. Furniture is still too often selected without regard to the room in which it is to be placed.

ADAM FURNITURE DECORATION AND ORNAMENTATION. Adam furniture is marked by the presence of fine detail. Classic moldings of diverse forms, minutely rendered with fine precision and attention to harmony, enrich the pieces. Hexagon, octagon, and oval panels enriched with acanthus, olive, and honeysuckle ornament, arranged in units or repeated over the surface, were leading decorative features. Oval forms are favored, from the chair backs to the oval panels and patera which are much used for decorative purposes. Fluting is used on nearly every piece of Adam furniture, and the classic urn, sometimes called the Adam urn or vase, is almost as familiar a type of embellishment. Many motifs were adopted also from the Louis XVI period. Among these are the straight tapered leg, the serpentine swell, festoons of drapery, and pendant strings of bellflowers. Swags of flowers and husks, and spandril fans are other types of decoration which will be found frequently on Adam furniture. Adam furniture was also tastefully decorated with minute Pompeian motifs and often hand painted by the great artists, Angelica Kauffmann, and Pergolesi.

Robert Adam loved especially things in satinwood, painted with garlands or arabesques; also with little figure pictures of medallion shape. The garlands or arabesques were commonly painted on the wood itself, the medallions frequently on plaques of copper, inlaid so as to be level with the surface of the wood.

ADAM GENERAL FURNITURE CHARACTERISTICS. (1) Classic and fine details. (2) Decoration rather than form. (3) Delicate fluting. (4) Good proportions. (5) Gilding and painting. (6) Inlay. (7) Light and dainty. (8) Rich classical moldings. (9) Straight lines.

ADAM FURNITURE ORNAMENT CHARACTERISTICS. (1) Acanthus. (2) Beadings. (3) Conventional moldings. (4) Dentils. (5) Egg and tongue. (6) Festoons of drapery. (7) Flowers and husks. (8) Fluting. (9) Honeysuckle. (10) Oval forms. (11) Pendants. (12) Spandril fan. (13) Grecian urns and vase. (14) Ram's head. (15) Rosettes.

Industrial Arts

There is need of a wider vision. There is too much of a tendency to shop for the shop's sake, and not enough for the boy's sake. The great purpose of industrial arts is to teach certain important and significant elements in civilization—to represent the industrial and mechanical side of our civilization within the school border.—*Lewis Gustafson.*

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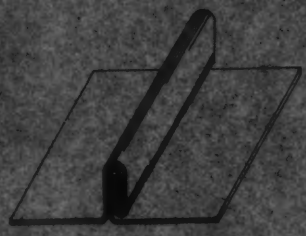
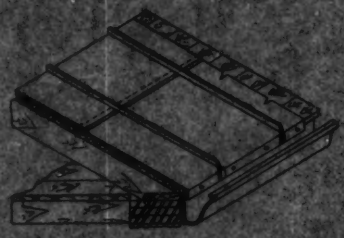
~ LOCKS, SEAMS, AND JOINTS USED ON ROOFING AND CORNICES ~

NO. 1 - FLAT LOCK
Flat seam roofing - roof not steep

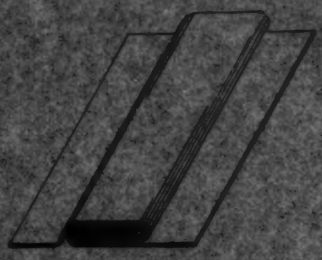
NO. 2 - SINGLE STANDING SEAM
Galvanized roofing



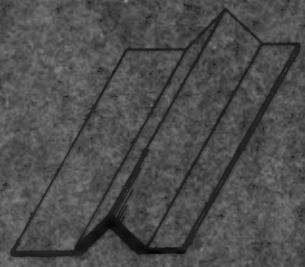
NO. 3 - DOUBLE STANDING SEAM
Steep roofs



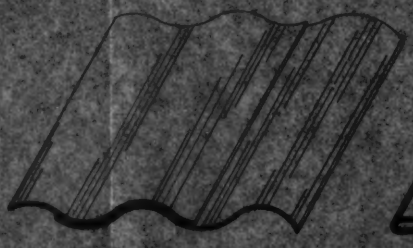
NO. 4 - STANDING SEAM FOLD
Peak of roof and bottom where edge is turned



NO. 5 - DOUBLE FLAT SEAM
Galvanized flat roofing



NO. 6 - V-CRIMPED JOINT
V-Crimped roofing

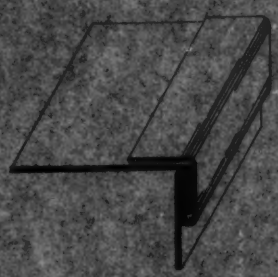


NO. 7 - CORRUGATED JOINT
Corrugated roofing, Culverts

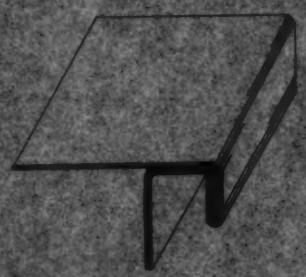
NO. 8 - EXPANSION JOINT
Copper roofing

NO. 9 - CLINCH JOINT
Connecting two parts of cornice

NO. 10 - OFFSET CLINCH LOCK
Cornice



NO. 11 - PITTSBURGH LOCK
Cornice molding



NO. 12 - OFFSET CLINCH LOCK
Cornice

Designed by J. F. Soltz and Henry Anderson, Ithaca, N.Y.

For Description See Page 337, Industrial Arts Magazine, September, 1928.

TRACING SUPPLEMENT No. 104,
THE INDUSTRIAL-ARTS MAGAZINE,
SEPTEMBER, 1928

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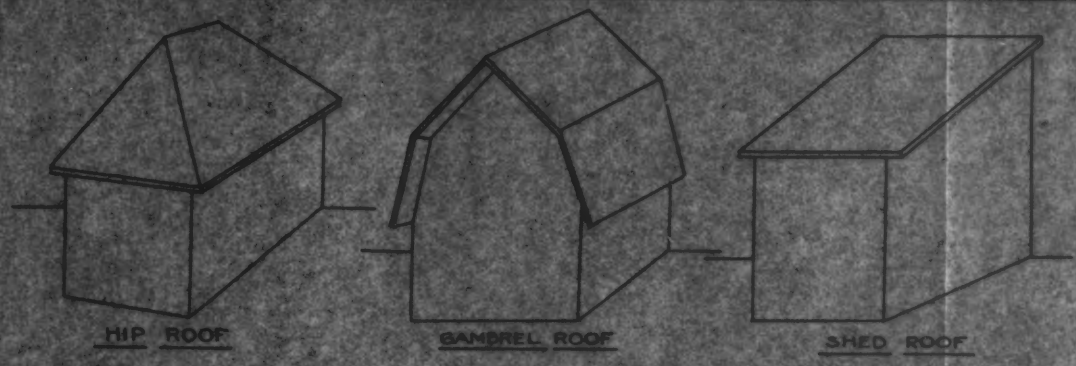
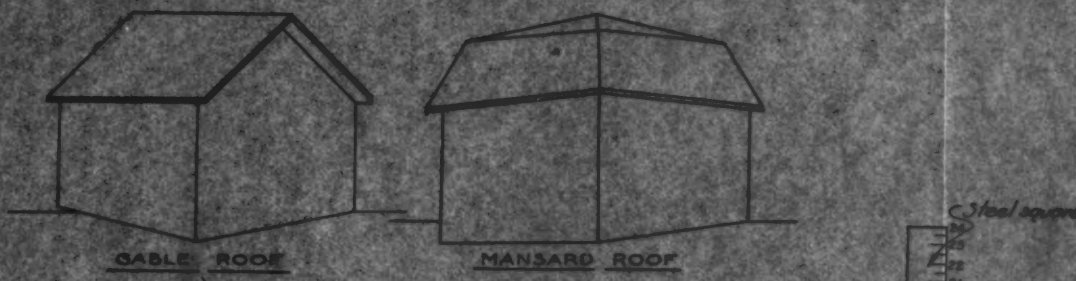
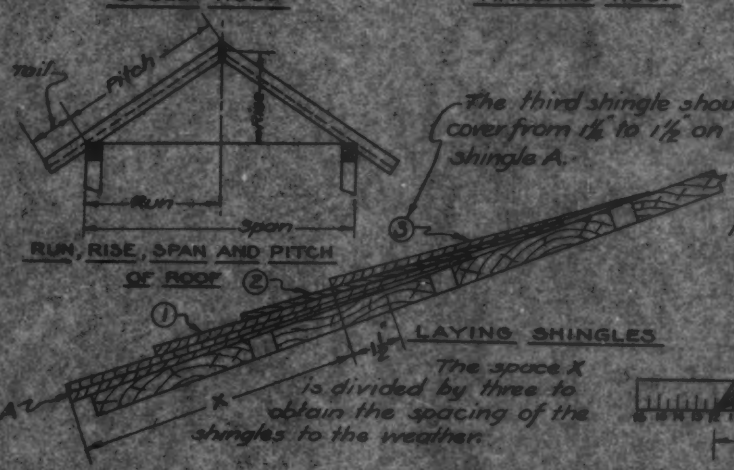
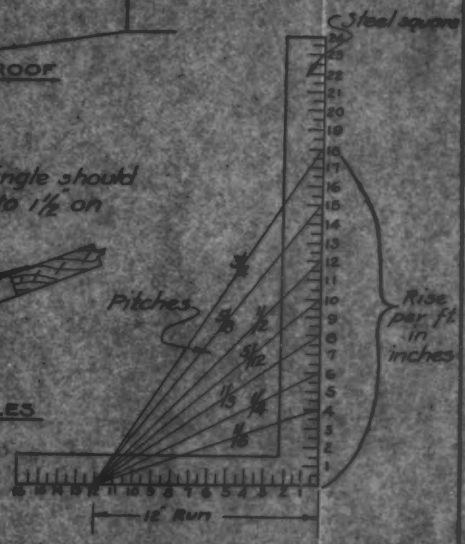
USEFUL INFORMATION ON ROOFS & ROOF CONSTRUCTION - By J. F. Faber & Fay Daley

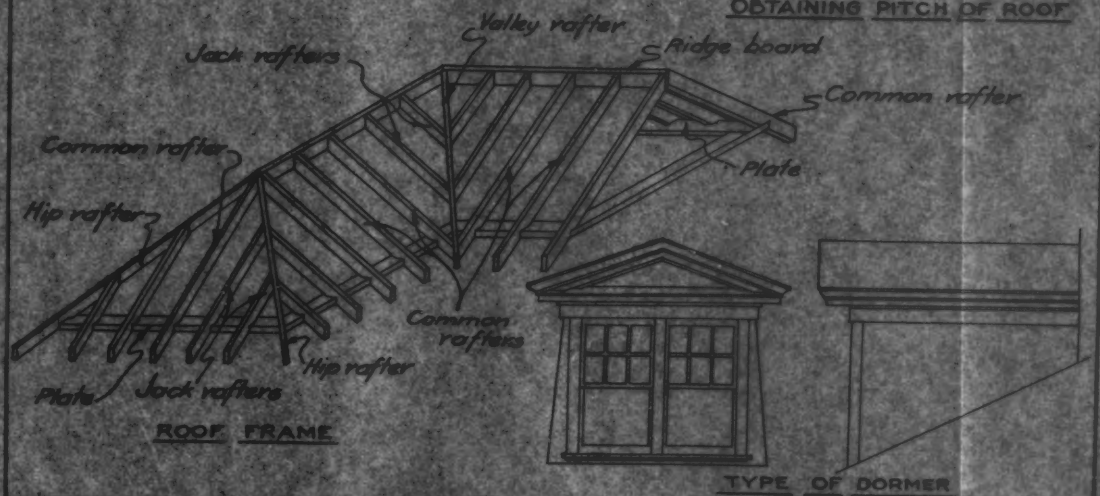





rafter
pitch
Run
Span
RUN, RISE, SPAN AND PITCH OF ROOF
The third shingle should cover from 1¼" to 1½" on shingle A.
LAYING SHINGLES
The space X is divided by three to obtain the spacing of the shingles to the weather.



OBTAINING PITCH OF ROOF



ROOF FRAME

TYPE OF DORMER

Designed by J. F. Faber and Fay Daley, Erie, Pa.

For Description See Page 337, Industrial-Arts Magazine, September, 1928.

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THE INDUSTRIAL-ARTS MAGAZINE,
SEPTEMBER, 1928

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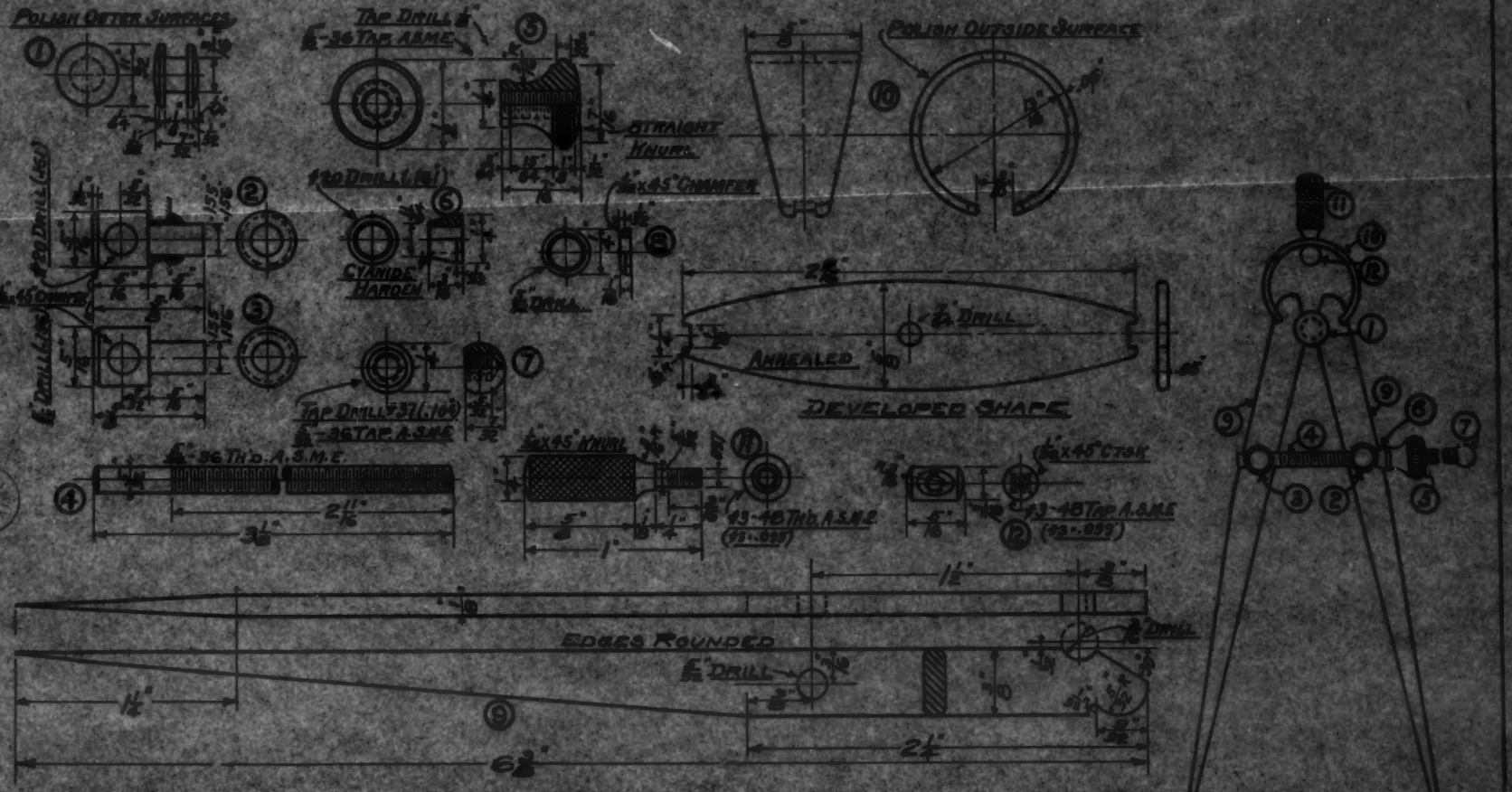

NO.	PART	MAT.	Mach
1	CALIPER SPOOL	ST.	1
1	TRUNION POST, Loose	"	2
1	" " , Fixed	"	3
1	CALIPER SCREW	"	4
1	" THUMB NUT	"	5
1	" SCREW WASHER	"	6

NO.	PART	MAT.	Mach
1	CALIPER SCR. BALL	ST.	7
2	TRUN. POST WASHER	"	8
2	DIVIDER LEGS	"	9
1	" SPRING	"	10
1	KNURLED DIV. HEAD	"	11
1	" " NUT	"	12

6" DIVIDERS

Designed by W. P. Childs, Alhambra, Calif.

For Description See Page 337, Industrial-Arts Magazine, September, 1928.

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THE INDUSTRIAL ARTS MAGAZINE.
SEPTEMBER, 1928

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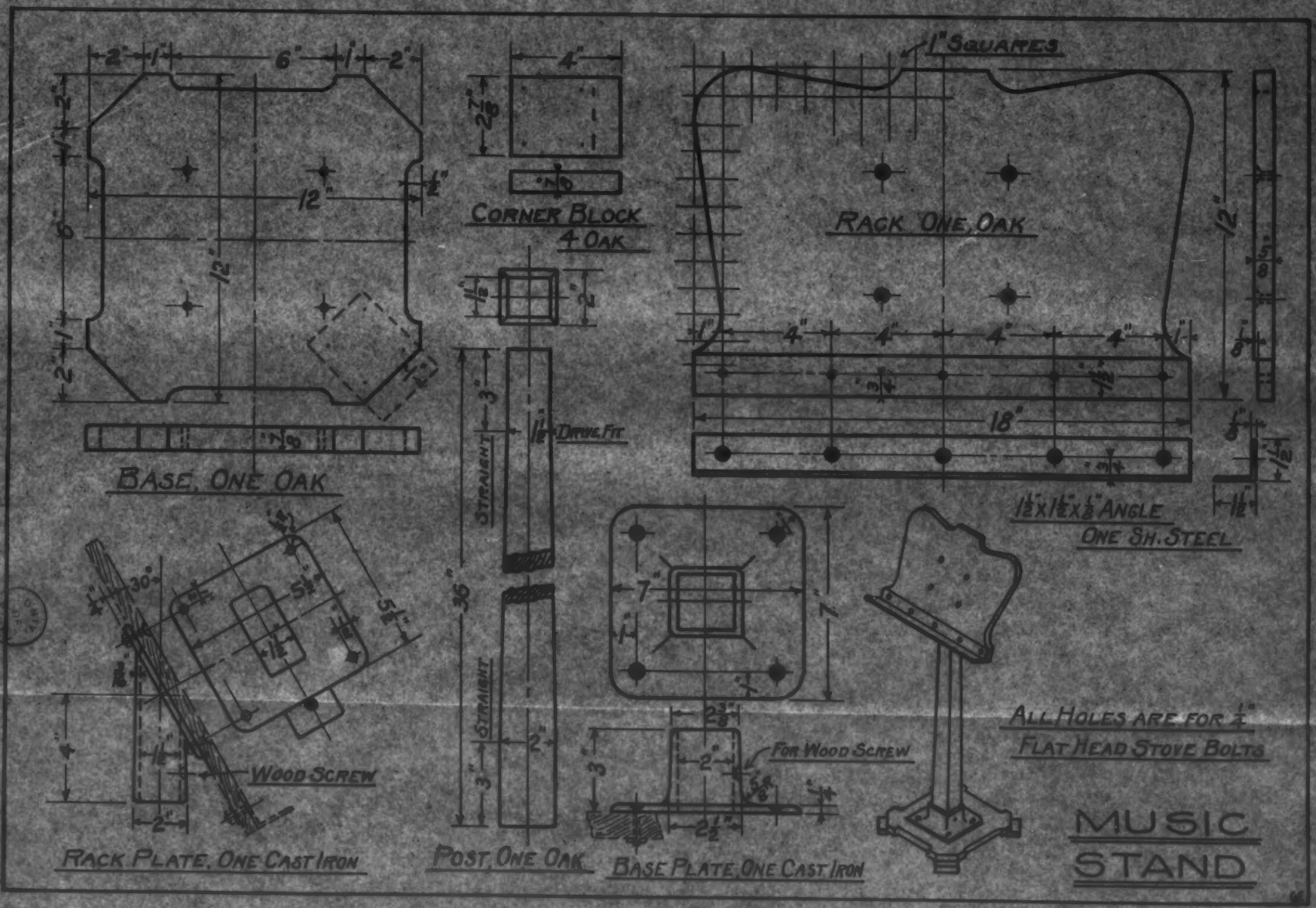


Designed by Claude L. Kulp, Ithaca, N. Y.

For Description See Page 337, Industrial Arts Magazine, September, 1928.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

A DESK CHAIR

Margaret Fullerton

The chair shown in the accompanying drawings was designed for use with the spinet desk described in the February, 1925, issue of the INDUSTRIAL-ARTS MAGAZINE, and is built with a low seat and high, curved back which greatly lessens the fatigue of long hours of study.

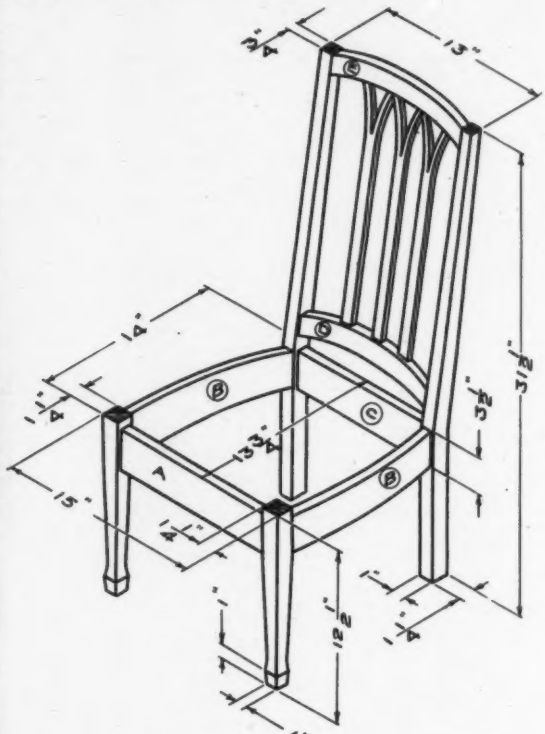


FIG. 1. DESK CHAIR.

The use of curved side rails solves the problem of making the back of the chair narrower than the front while permitting the mortises in the posts to be cut at right angles to their surfaces. The shoulders of the tenons are cut at right angles to the face sides of the pieces from which the rails are to be sawed. Figure 2A illustrates the manner in which the side rails are laid out. In selecting the lumber for these pieces, the grain should run as indicated by the crosshatching lines in Figure 2B rather than as shown at C.

The chair might also be made of mahogany, inlaid with satin-black walnut. It was inlaid with Circassian walnut and ebony, and fitted with a spring seat covered with silk tapestry in a combination of brown and old gold.

The chair might also be made of mahogany, inlaid with satinwood and ebony, and upholstered with black and gold tapestry.

Fig. 1 DESK CHAIR
- A, Front Rail;
- B, Curved Side Rails;
- C, Straight lower Back Rail;
- D, Curved middle Back Rail;
- E, Curved upper Back Rail.

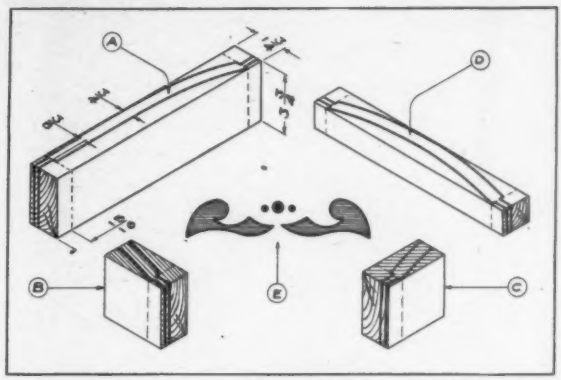


FIG. 2. DETAILS OF DESK CHAIR.

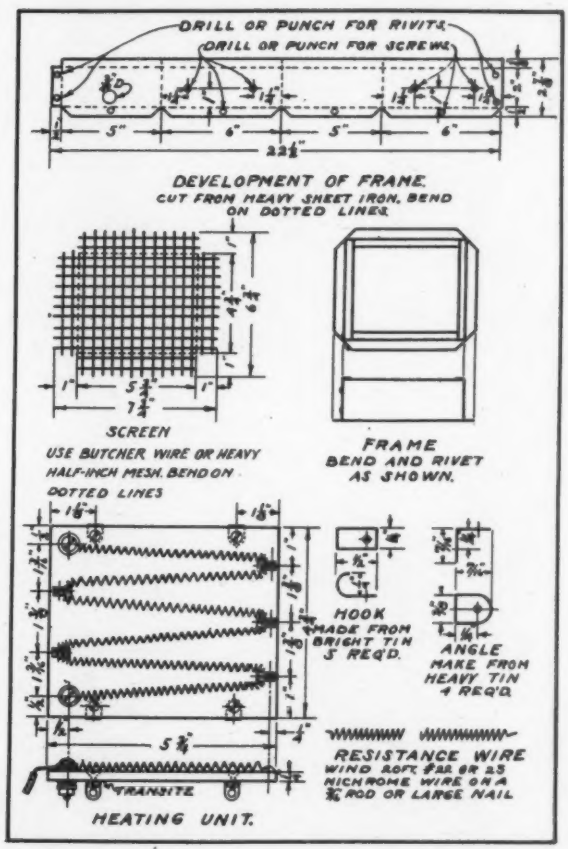
Fig. 2. DETAILS OF DESK CHAIR
- A, Method of laying out Side Rails;
- B, Part of a Side Rail showing a good choice of lumber;
- C, Part of a Side Rail showing a poor choice of lumber;
- D, Method of laying out Curved Back Rails;
- E, Design inlaid upon the Front Rail and upon the Upper Back Rail.

ELECTRIC TOASTER STOVE

Lee M. Klinefelter, Ruffner Junior High School
Norfolk, Virginia

This little toaster has proved very popular in the electrical shop at Ruffner, for it is something that can be used in almost any home and a problem that the average boy can complete in a workmanlike way. There are no long and tiresome operations, and no materials are used that cannot be readily obtained. Since it involves woodwork, sheet-metal and electrical work it is well suited for use in the general shop.

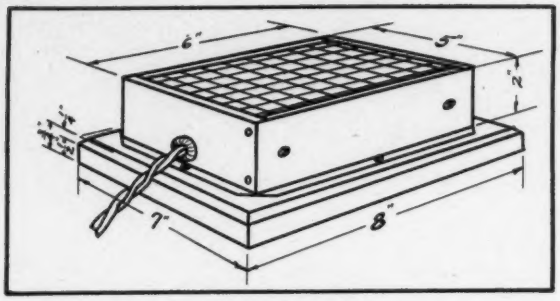
Our practice has been to buy the transite board and nichrome wire in sufficient quantities to make a number of toasters, thus



DETAILS OF ELECTRIC TOASTER STOVE.

reducing the cost on each. About 40 have been made to date at a cost of 45 cents each. This price does not, of course, include the attachment cord and plug. Many of the boys bring in old cords and plugs from home, so 45 cents is the total cost to them.

If transite cannot be obtained, ¼-in. asbestos millboard is ample protection for the wood under it. However, the transite construction is recommended as being more in accord with commercial practice in heater construction.



ELECTRIC TOASTER STOVE.

Methods of Procedure

1. Lay out, cut, bend, and rivet frame.
2. Drill or punch holes in frame.
3. Lay out, cut, and bend screen.
4. Solder screen to frame in a few spots.
5. Cut and drill transite board.
6. Make hooks and angles.
7. Coil resistance wire.
8. Assemble heating unit.
9. Mount heating unit in frame.
10. Put in insulating bushing. Heat inside end of bushing with match and bend edges over to hold it in place.
11. Connect attachment cord and put on plug.
12. Cut out baseboard, plane, and sand.
13. Paint base with black enamel and let it dry.
14. Screw stove to base.
15. Paint stove and base with black enamel.

Note: If transite cannot be obtained, use ¼-in. asbestos millboard on ⅛-in. wood of same size. Fasten hooks down with wood screws. Screw through frame into wood to hold heating unit in place.

GAME TABLE

E. C. Powell, State Normal College, Bowling Green, Ohio

The William and Mary game table, with inlaid checkerboard top illustrated herewith works out well in walnut, oak, or mahogany. The checkers are 1¾ in. square, and as thick as the top. They are made by the customary method of gluing together alternate strips of walnut and maple. The strips are then sawed across the grain and the alternate strips turned end for end. These in turn are glued and clamped, and the rest of the top is glued up around the checkerboard.

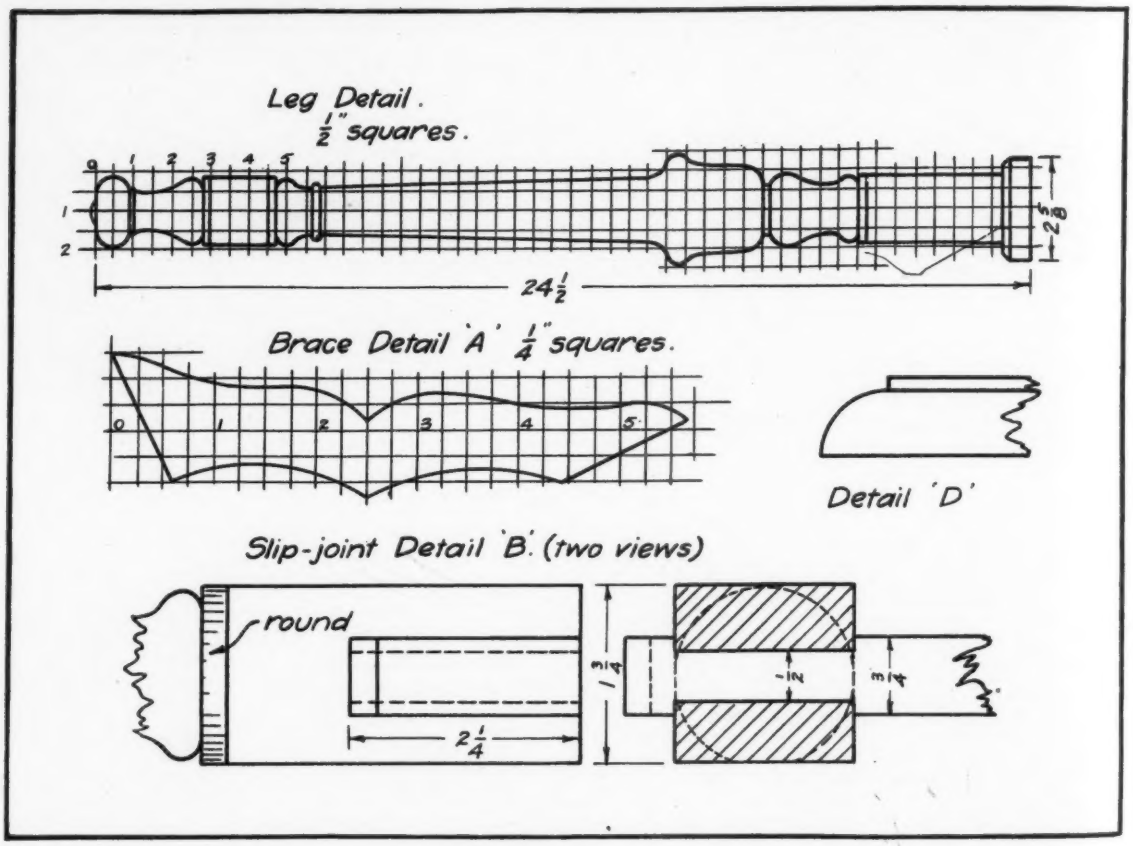
The ellipse for the top is drawn by the pin and string method. The top edge mold is shown in detail D.

The leg design, has been carefully worked out, and gives a pleasing effect. Special care should be given to transitions from round to square stock, and in the shaping of the bell. This leg is made of 1¾-in. stock, with extra material glued up to form the bell. It is well to turn one leg, and make a template from it, in order that all four legs may be as nearly alike as possible. All dimensions for it may be read directly from the leg detail.

The brace A is a modification of the customary William and Mary bracing to allow space for players' knees on either side of the leg. This bracing arrangement carries out the elliptical effect of the top.

Section C is a cross-lap joint, which fastens directly to the top of each leg with screws, and gives a good support for the top. This section permits screws to be driven through it directly into the top.

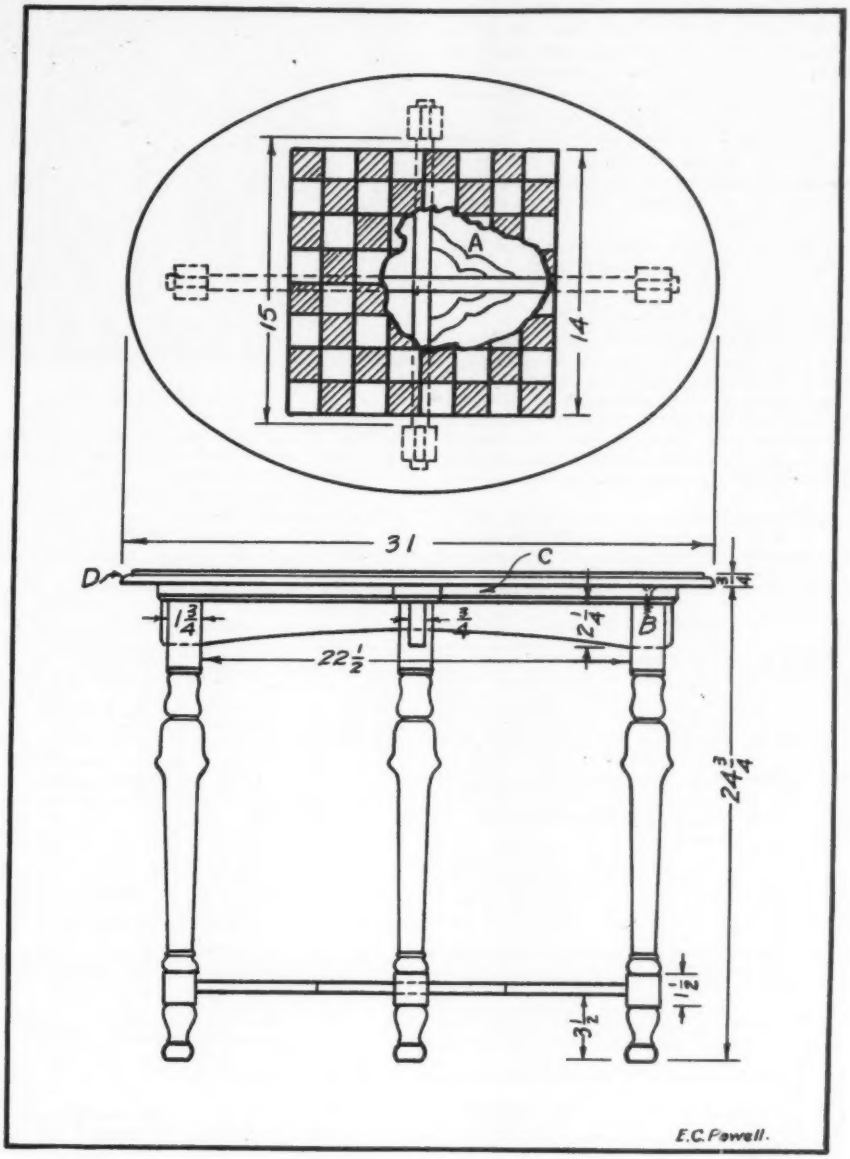
Detail B shows the slip joint through the top of the leg. This is also a lock joint. The leg slot should be glued, and securely clamped. It may be pinned if desired.



DETAILS OF GAME TABLE.

Finish with filler, shellac, and varnish. The under part may be waxed, if desired, but the top will be more satisfactory if it is given at least two coats of varnish, and rubbed.

mitered braces which are screwed in place. The support for the ledge can be half-lapped into the upright or may be bolted on the inside with carriage bolts. The 2-by-2 grooved pieces that hold the



GAME TABLE.

PORTABLE WIRING PANEL

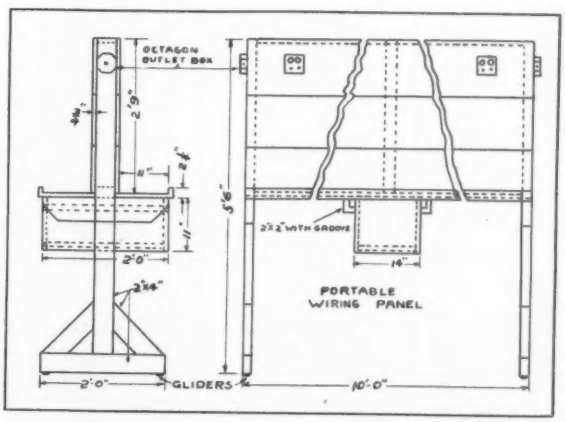
C. H. Krueger, O'Keefe Junior High School
Atlanta, Georgia

When the O'Keefe electric shop was organized in its temporary headquarters, considerable trouble was encountered in arranging the room so that large classes in elementary wiring could be handled in each of the six 50-minute periods during the day. Booths were out of the question, and a dummy framework of a house suitable for practice wiring proved to be too large in which to build a small temporary electrical shop.

Finally, it was decided to construct a number of portable wiring panels that could be moved into the classroom after the usual period of electrical theory.

The panel described herewith will be found to be very helpful in any electrical class where floor space is at a premium. It allows plenty of room for the pupil to do his work, and yet can be easily pushed into an out-of-the-way place against the wall.

The frame of the panel is made of 2 by 4's with the upright piece mortised into the bottom piece and then held securely by two



drawer in place may also be bolted. The drawer is accessible from either side, and is very convenient for storing wire, staples, and screws. Near the top are four fuse blocks on each side and BX cable is run to each of the boxes through the inside of the panel so that the fuse blocks can be attached to the 110-volt line. A set of binding posts are arranged beneath the fuse boxes, and these may be connected to either a low voltage a.c. or d.c. current for various experiments. All are plainly marked and a double-pole double-throw switch on one end of the panel controls the kind of current to be used. The 2¼-in. strips that are nailed to the ledge, prevent the wire and screws from falling on the floor. A piece of ½-in. pipe is strapped on top to be used where ground return systems are taught. Softwood should be used in the construction of these panels, so that screws can be driven into the wood without difficulty.

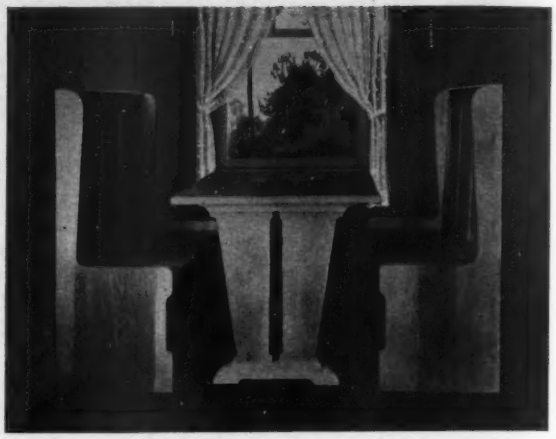
The wiring panel described herewith accommodates from eight to twelve boys. It can be made in different lengths to fit any convenient storage space.

BREAKFAST-NOOK FURNITURE

D. C. Blide, State Teachers College, Minot, North Dakota

The present tendency in small-house designing is to eliminate the large and expensive dining room which is used for so short a time each day. As a substitute, there will usually be found off the kitchen, a very small room with built-in furniture. This room is sometimes called a breakfast nook but quite often it is used for all the family meals. Usually the houses equipped in this way have an extra large living room, which on state occasions may be used as a dining room.

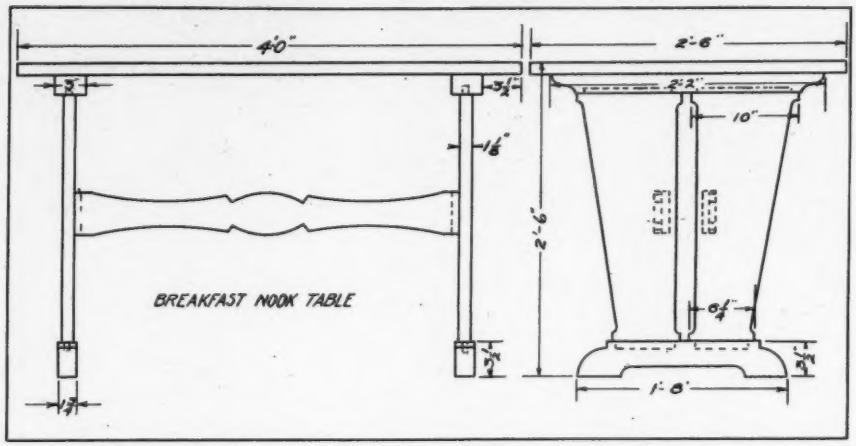
The breakfast set illustrated herewith is planned to go into a space 4 ft. 6 in. by 5 ft. 8 in. It is made of western pine with fir panels. It also may be made of hardwood and stained and varnished.

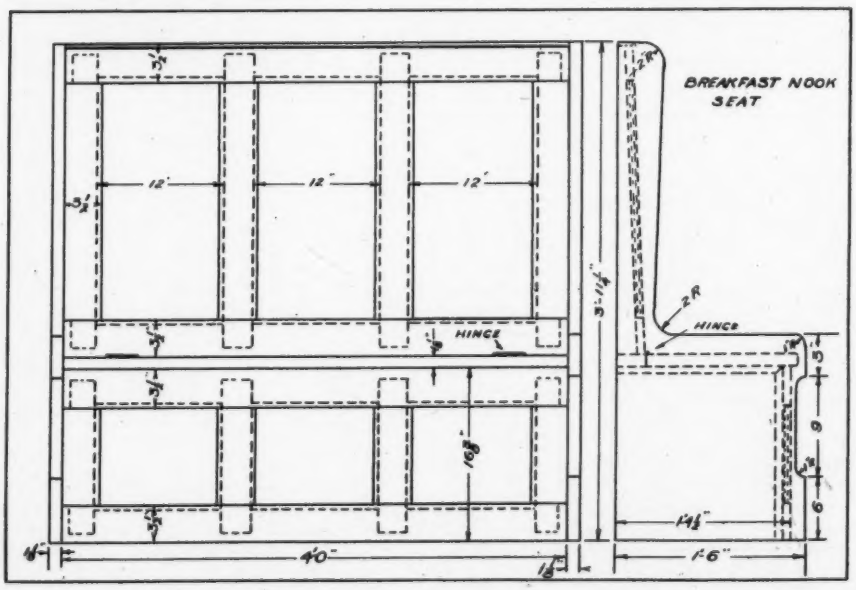


THE BREAKFAST NOOK.

The kind of wood and finish will, of course, depend upon whether it is to match the woodwork in the living room or kitchen, or whether it is to be painted or enameled.

The construction of this set will challenge the very best efforts of the boys in advanced woodwork, and it will be found to be an ideal project for machine woodwork, involving the use of the jointer, planer, band saw, circular saw, mortiser, tenoner, and shaper. The set, of





course, also may be made with the hand tools found in the average school. It will be noticed that the covers of the seats are hinged, thereby providing for additional storage space that every housewife will welcome.

Only the general dimensions are given, as in most cases they will have to be altered to fit individual cases. Very often a useless pantry can be converted into a cozy breakfast nook, thereby making the house more modern. In such cases, the living and dining room may then usually be converted into one large living room by the removal of the old-fashioned arch between the two rooms.

STUDYING INDUCTION MOTORS

William G. Patterson, Everett Vocational School
Everett, Washington

The experimental board described herewith is so arranged that the student is able to study the effects of changes in voltage, phase, frequency, and speed on squirrel-cage induction motors. With this piece of apparatus, the student can actually see the performance of such a motor operating under these different conditions before he attempts to make the changes on a regular motor. Before this arrangement was used, many of the motors that were used for reconnecting purposes needed to be rewound or have repairs made on many of the coils at frequent intervals. The reason for this was because the motors had been reconnected so many times that wires and coils had been damaged to such an extent that it was impossible to go on with the work until the repairs had been made.

This was all overcome by bringing out all of the coil ends to binding posts which were arranged in a circle on a transite board, the coil ends holding the same position on the board as they held in the motor. Black wire was used for one side and white wire for the other side of the coil. This was done so that there was no possible chance of getting any of the coil leads wrongly connected. As each wire was brought out from the motor, it was tagged and numbered so that if one of the wires became broken it could easily be replaced in the proper position. All the connections could then be made by connecting the binding posts in the order in which the condition at hand called for.

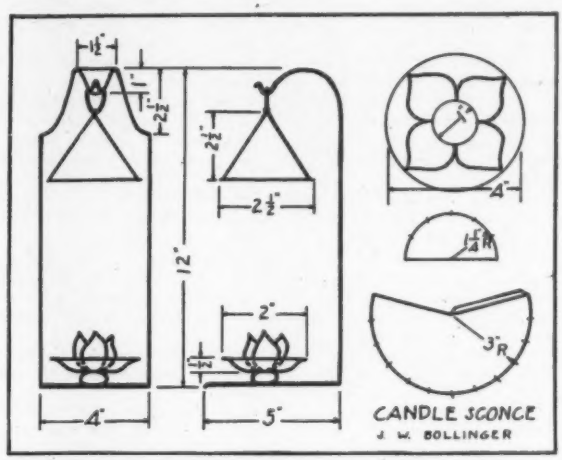
The motor that was used with this arrangement was a 5-h.p., 3-phase, squirrel-cage induction motor, having 48 coils. After removing the end bells and rotor, all the wires connecting the coils were cut loose, leaving just the coil ends. By the use of a test set, the leads from each coil were found and to these coils were soldered suitable lengths of wire to reach from the motor to the board; black wire being used on one lead to the coil, and white for the other lead of the same coil. The first wire soldered to the first coil lead was a black wire and was taken as No. 1; the other lead of the same coil was a white wire and was taken as No. 2, and so on around the motor. After all these wires had been soldered to the coil ends, the rotor and end bells were replaced and the wires brought out of the ventilation openings in the motor frame. The wires were then soldered to the binding posts on the board, the No. 1 lead being soldered to binding post No. 1; No. 2 to binding post No. 2, and so on around the board until the 96 coil leads were connected.

A clear understanding of the construction of such a board may be had by referring to the diagram. Any insulating material such as slate, fiber, etc., may be substituted for the transite and Fahnestock connectors may be used in place of binding posts.

CANDLE SCONCE

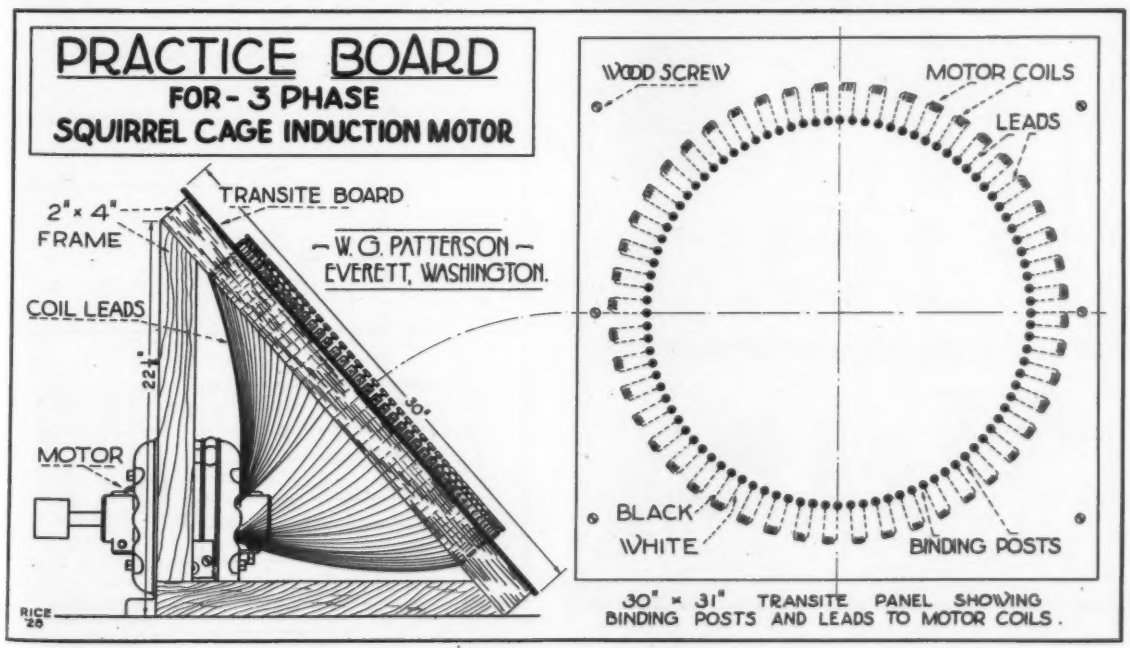
J. W. Bollinger, Tulsa, Oklahoma

This candle sconce is an interesting problem for sheet-metal classes in the junior high school. It can be made of No. 24 gauge black iron, or a similar thickness of copper. In either case a hammered finish may be applied, and the completed problem coated with clear lacquer, to preserve the finish. The hammering should be done before any of the pieces are bent or shaped.



Begin by making the back. The hood may be made next, according to the development shown in the drawing. The edges are to be riveted together with 1-lb. iron or copper rivets; the bottom should then have a burr ⅛ in. wide turned on it, for ornament. Make a small ring about ¾ in. in diameter out of No. 18 iron wire, and put this through the point of the hood. A large ring, shaped somewhat as in the drawing, made of No. 12 iron wire, will suspend the hood from the hook which is part of the back.

The candle will be held by a four-leaved rose-petal cup, as shown in the drawing. To shape this cup after it has been cut out, clamp a piece of ⅞-in. round steel in the vise, lay the metal over this, and hammer it to the shape desired. The leaves will overlap somewhat; if the peen end of a machinist's ball-peen hammer is used to do the bending, the hammered effect will not be destroyed.



To make the saucer or tray part, secure a block of hardwood, and hollow it out on the woodshop lathe, so that it will have the same design as shown in the illustration. Cut a piece of iron or copper about 3½ in. square, place it over the hollowed part of the block, and hammer the metal down into the depression with the peen end of a machinist's ball-peen hammer. Begin at the outside and work toward the center. Be careful to hold the piece securely, so that it will not slip out of place, or cause the depression in it to become too deep. Trim the material down to the size specified. Note that if the material is cut the right size to begin with, it will tend to buckle or crack along the outside edge when the hammering is begun.

The part which supports the saucer is a piece of 1-in. round iron, ½ in. thick. If copper is used, make a small tube of the same outside dimensions, and solder it to the bottom of the saucer. Do the soldering on the inside. This part enhances the attractiveness of the design.

The cup, saucer, and base may be held to the bottom of the sconce by means of a $\frac{3}{16}$ by 1 in. black iron rivet.

To produce a rich black color on the iron, coat the piece with linseed oil, and burn this off over a fire. To produce a black color on the copper, bathe the piece in a solution of liver of sulphur. Polish the high points with steel wool. Finish with a coat of clear lacquer.

CLEANING THE CARBURETOR

Ray F. Kuns, Cincinnati, Ohio

Liquid fuel is certain to have more or less sediment in it. Of course all cars have fuel strainers at points along the fuel line, but much of the sediment is so fine that it will actually pass the screen. For this reason it is a good plan to take the carburetor from the car at least once a season and take it to the bench and carefully disassemble it and clean it.

After having removed the carburetor, clean the outside of it with a stiff brush and some kerosene or gasoline. Do not use ethyl or similar treated gases for cleaning.

Next, go about the job disassembling the parts. Turn out the holding screws carefully and lay them aside where they cannot be mixed to cause trouble later. Remove the float and the float needle. Shake the float to see whether there is any gasoline in it. If there is, replace or repair it. Check up on all gasoline and air passages, particularly the very fine ones. Probe these with a very fine wire to force out any dirt which might have found lodging. When all of the dirt has been located and removed, the job may be reassembled and replaced on the engine. Use good gaskets at all points where they are required, and see that all screws, nuts, etc., are set up snug. Don't forget lock washers where they are required and see that new cotter pins are used where needed. It is the little things which give trouble about the gas system.

Of course it would hardly pay to clean up the carburetor if the main tank and the vacuum tank were not likewise inspected and cleaned. Sediment cups should be checked up and freed of their accumulation of dirt. The vacuum tank has strainers in it. Clean them.

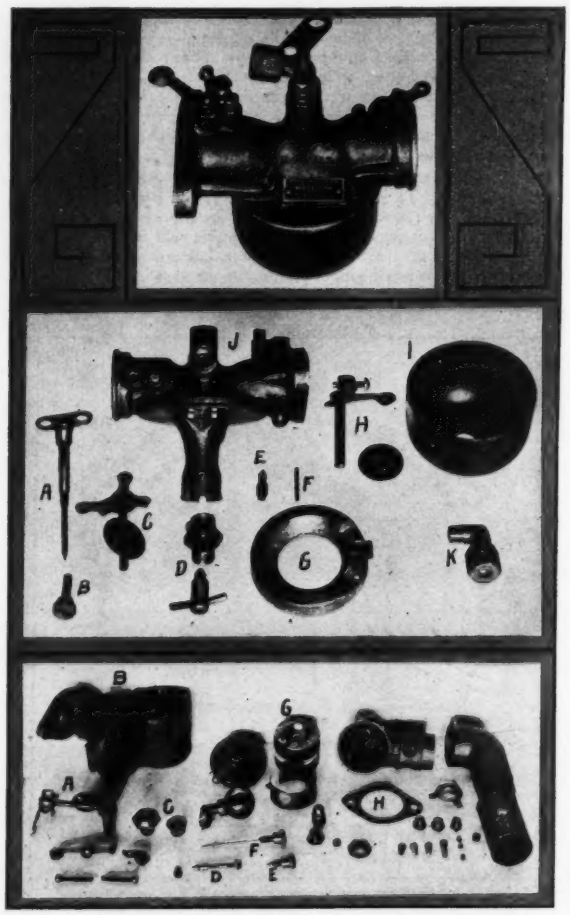
A Ford carburetor is shown in Figures 1 and 2. A, in Figure 2, is the gasoline adjusting needle which fits in the nozzle B of the carbureter J. C is the choke, and H is the butterfly throttle. E is the gasoline supply cut-off needle actuated by the float G which is mounted on the carburetor body J by the pin F. I is the carburetor bowl which carries the float on its inside. K is the gasoline supply-line connection. D is the drain cock which goes under the carburetor and the upper part of which is used to lock the bowl to the body.

On the Stromberg carburetor shown in Figure 3, B is the carburetor body, A is the throttle, C is the screen, G is the float, F and E are the gasoline adjustment needles, D is the economizer nozzle, and H is the carburetor flange which fastens to the engine. Many screws and other parts are not marked.

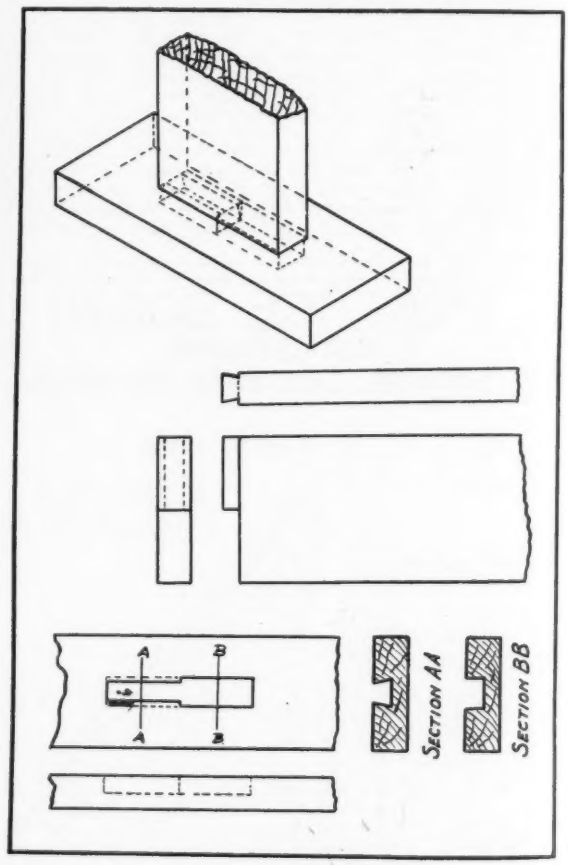
A BLIND DOVETAIL JOINT

David Alkazin, Morse High School, Bath, Maine

One of the senior-high-school students in one of my classes decided to make the desk and chair shown on page 487 of the December, 1923, issue of the INDUSTRIAL-ARTS MAGAZINE. In analyzing the project, we arrived at the joint which is to connect the stretcher to the sides of the desk. Several joints were considered, such as a dowel butt, a stub mortise and tenon, a blind mortise and tenon, but we were afraid that all of these would loosen up at some time in the future. We, therefore, developed a blind dovetail joint which will



THE CARBURETOR.



BLIND DOVETAIL JOINT.

never become loose. The illustration shown herewith gives no dimensions because it is applicable to many types of problems.

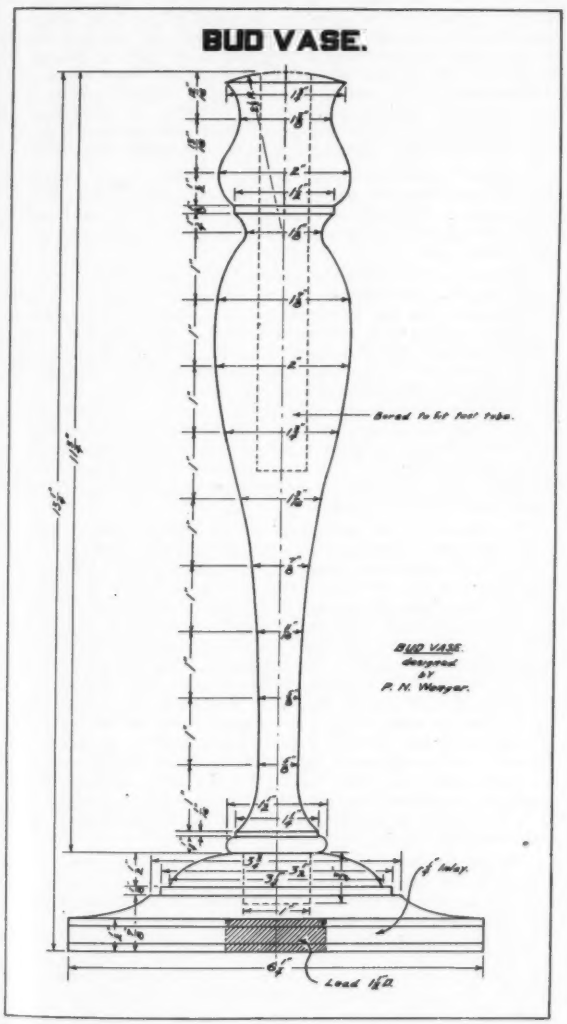
A BUD VASE

Paul N. Wenger, Lebanon High School, Lebanon, Pa.

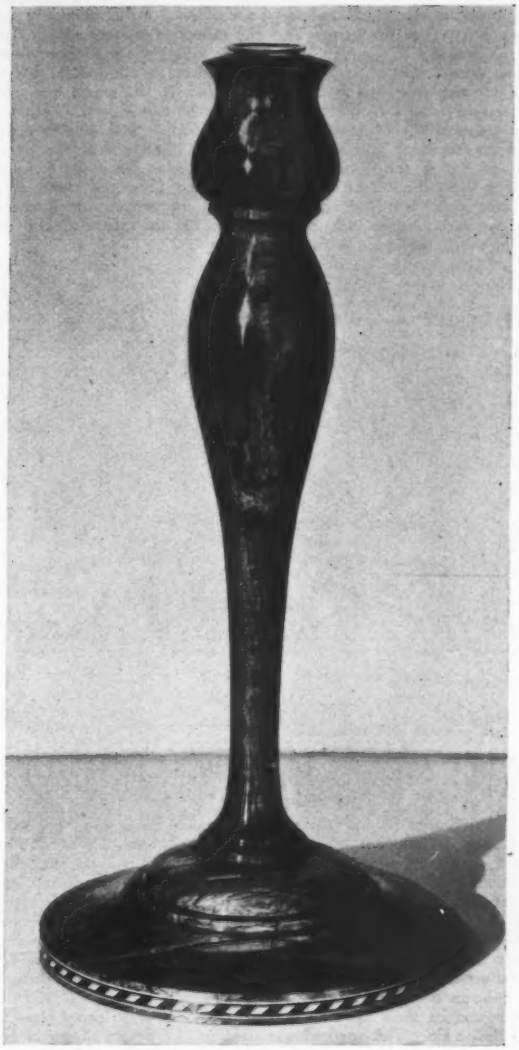
The bud vase described herewith is very simple and yet quite attractive. After the boy has learned the fundamentals of wood turning, he is in line for a project that requires both spindle and faceplate work. By omitting the inlay and making only one bud vase, the project is very simple. Furthermore, by using the inlay and making a pair of bud vases, the project becomes suitable for the more advanced students.

Bud vases have become very popular of late years. The one here shown is very graceful and well proportioned, and allows a change from the usual type of projects. There are opportunities for individuality in the design of the stem or base. The construction and turning of the project include various tool operations.

The wood from which this project is made may be any kind that is suitable for wood turning. As the amount of material used is very small, it is advisable to use one of the more expensive woods. The project in the accompanying photograph was made of Oregon myrtle. This wood is very hard, takes a beautiful natural finish, and gives a marvelous display of graining.



The hole for the lead weight in the base may be cut square with the mortise machine, or it may be turned on the screw chuck before fastening it to the faceplate. The base may then be weighted with lead as follows: Fill the hole with air-rifle shot, pour hot paraffin over the lead, allow several minutes to cool, and level the lead and paraffin to the proper thickness. This gives the bud vase sufficient stability for practical purposes.



It is advisable to turn the base and stem as a single unit. Therefore, mount the base upon the faceplate, cut to thickness, and then bore the center hole. The hole in the stem for the test tube should be bored between the lathe centers before gluing the stem and base together. The stem may then be turned to a rough cylinder, having a tenon so as to fit the hole in the base. The rough stem is then glued to the base. After gluing, a center plug must be made to fit the test-tube hole for the dead center. The project is then ready to be turned to the given design.

The inlaying process is very simple. The inlay should be selected so as to harmonize or to contrast with the wood from which the project is made. A groove should then be cut with the parting tool to the proper width and depth for the inlay. Next, the inlay is cut to the proper length, allowing ¼ in. for overlapping the seam. The edges of the inlay are then cut to a taper so as to overlap, and yet not increase the thickness of the inlay. After spreading glue upon the strip of inlay and in the groove, properly place the inlay upon the project. A small hand screw tightened across the base with one jaw holding the inlay seam in place is sufficient for clamping. After allowing sufficient time for the glue to dry, the hand screw may be removed and the entire project may be thoroughly sanded. It may then be finished according to the desire of the person making the project.

ART AND MANUAL TRAINING — LAMP STANDARDS AND SHADES, PART 2

C. Anthony Van Kammen, Grand Rapids, Michigan

Quite as important as the lamp standard itself is the shade which adorns it. For the standard developed in the first part of this article which appears on page 183 of the May, 1928, INDUSTRIAL-ARTS MAGAZINE, the size and shape of shade considered appropriate and within the ability of the 7th-grade boy is shown in the surface develop-

ment, Figure 1. The cap or wooden top is made from the same kind of stock as the base. The dimensions of the pieces are shown in the drawing, Figure 2. To make the peak A, use a piece of stock 1 in. square and 6 in. long so that it may be handled in the vise and file the cove with a ¼-in. round file. If the proper size gouge or carving tool is available the cove may be carved out. Rough out the point with a backsaw and plane to shape. Saw off the pointed end in the miter box to required length. Shape the piece B that fits the top of the shade and fasten A to it at the center with glue and a 1-in. No. 6 f.h. screw. The piece C is the same size as B, but it is chamfered from very near the center, where a slight depression is made, with a countersink for the point of the globe upon which the shade is to rest.

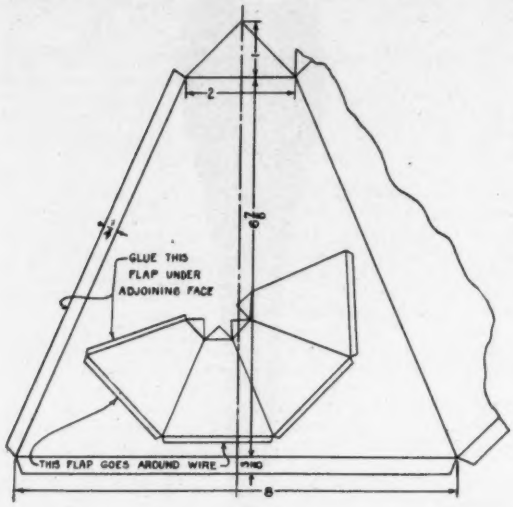


FIG. 1.

Parchment for the shade may be made, or it can be purchased where artist supplies are sold. The small cost, $1 to $1.50 per yard for 40-in. wide commercial material, does not warrant the expenditure of time necessary for making the home product. Appropriate braids may be purchased in the art or drapery departments of most large stores. For fastening the seam of the parchment, white shellac may be used as a glue. If desired, the seam may be stitched at a corner and the corners covered with a very narrow braid. A very satisfactory method of hiding the seams is to cover them with a built-up ridge of "reliefo" or "gesso."[1] The outline of the design may also be built up in this way, which gives a leaded-glass effect to the shade. This method was used on the design shown in Figure 3. A 7¾-in. square-wire rim is made to fit just inside the lower edge of the parchment. Turn the edge of the latter over the wire and stitch firmly with thread. Keep the stitches of equal length.

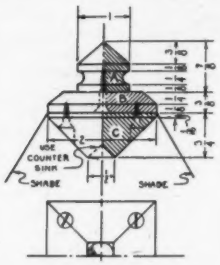
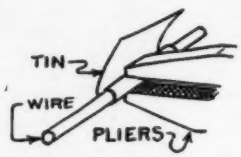


FIG. 2.



MOULDING THE TIN SLEEVE FOR THE RIM OF THE SHADE.

FIG. 4.

Figure 4 shows the method of joining the ends of the wire for the rim of the shade. A small piece of tin ½ in. wide is molded over the wire with a pair of pliers. This piece is slipped over the joint and is soldered in place. To counterbalance the weight of the joint a similar piece of tin is soldered on the opposite side of the shade, otherwise it will not hang even.

Constructing the shade is simple enough, but making a suitable design to decorate it appropriately is much more difficult. To help with the making of shade designs the manual-training teacher, unless trained and experienced in the use of color, free-hand drawing, and the application of the principles of design had best consult the art teacher. If a pattern and measurements for the shade are left with the supervisor, an interesting problem for the design class may be submitted and the resulting product will fill the demand for an immediate need. The entire lamp can be made in the shop if the teacher is capable of carrying on the artwork.

A few examples of good and bad designs, with criticisms and suggestions for their improvement, are given as an aid to the student and the teacher. These designs should not be copied, however. One form of decoration is to use a band effect around the shade, a narrow strip at the top and a wider one at the lower edge. (See Fig. 3.) In the upper band the movement is decidedly noticeable. The eye immediately travels in either direction from the central flower form. This movement is also evident in the wider band but not so marked. Figure 5 shows a similar treatment. Here the upper band is too wide and though the main stem has a wavelike rhythmic movement it is counteracted by cross lines in the leaf veins and stems. Several of the lines stop and seem to lead nowhere. The flower forms are ugly in shape while some of the leaves and leaf veins seem to grow contrary to the laws of nature. The two morning-glory flower forms are inharmonious with the other forms of the design.

Another treatment is to make on each side or surface of the shade a panel with its outline paralleling that of the side and having points of accent at the corners or on the central axis top or bottom. (See Fig. 6.) Figure 7 gives an interesting design which covers the entire surface, radiating from a point of accent on the inceptive axis near the base. This design was suggested in Figure 8, which has its center of interest at the center of the panel. The latter design is monotonous because all of the space divisions and resulting shapes are very near equal in measure and similar in contour. Because of the variation of the space divisions in Figure 7, the design is attractive and interesting. The covergence of the space division lines as they near the center weakens design Figure 8. Note the differences in Figure 7, where all the outlines parallel each other so that the spaces seem to fit together.

Figure 9 shows an attempt at balance which is quite successful. The leaf forms, however, are ugly and the stems seem to lead nowhere. The veining in the leaves is weak and uncertain. The panel outline would be improved if the upper and lower lines were closer to the edge of the shade.

Figure 10 is a combination of unrelated forms. The upper part of the design is conventionalized, and though the idea was to make it bisymmetric, the two halves, if studied closely, are quite different. The lower portion is a realistic treatment of the dandelion. Here again the designer intended that the two halves of the design be alike but the scroll in the lower right-hand corner intended to repeat the left scroll sends the eye searching off the right corner into space. The end of the leaf on the left pointing downward and outward also detracts from the interest in the design. The promiscuous use of short lines representing veins in the leaves give an explosive effect or unrest to the problem. The space inclosed by the design is very interesting. If the design were simplified and conventionalized the results could be made satisfactory.

In Figure 11 the motif used is the morning glory with one tendril and leaf. The unit is repeated five times in whole or in part and is bound together by continuing the stems to the adjacent unit. The stems on the two lower units weaken the whole as they lead the eyes away from the design. The trumpets or bells of the flowers are uninteresting and indefinite in shape and appear as though they were wilted rather than bold and crisp in outline which is the natural appearance of the flower. The veining of the lower-right leaf and that of the upper is indefinite. The problem has possibilities. If the sweep or curve of the stem from the upper flower to the lower corners were changed into a more gradual bend; if the two flowers on each side were dropped a little and placed on a curved stem instead of the straight one; and if the two lower flowers were made to almost touch the lower border and the stems from these were made to lead around the outside of the panel in a graceful twist, as is the nature of morning-glory stems, the design could be made interesting and usable.

While the foregoing is an attempt to give verbal directions for improving the designs, in the two sets which follow, an effort will be made to show graphically how a seemingly worthless jumble of lines and spots entirely unrelated can be made into a usable design. Except for the fact that the spaces are somewhat similar in shape and are balanced on a central axis the material in Figure 12A is apparently a failure and hopeless as a design for the purpose suggested. The parts do not hold together nor do they fill the inclosed space. By a close study of the two halves of Figures 12B the transition from the crude, ugly, sharp-angled spots on the left to the more graceful, rounded, related forms at the right will be quite evident. Note the difference in the quality of line used; that the outlines of the spaces parallel each other and thus "fit" together, and that the outline of the entire design follows the contour of the panel, Figure 12C.

Figure 13A is a much better beginning than Figure 12A. With the exception of the unrelated D-shaped spot at the lower right- and

[1] A very good "gesso" can be made by mixing shellac with whiting or silax to a thick paste.

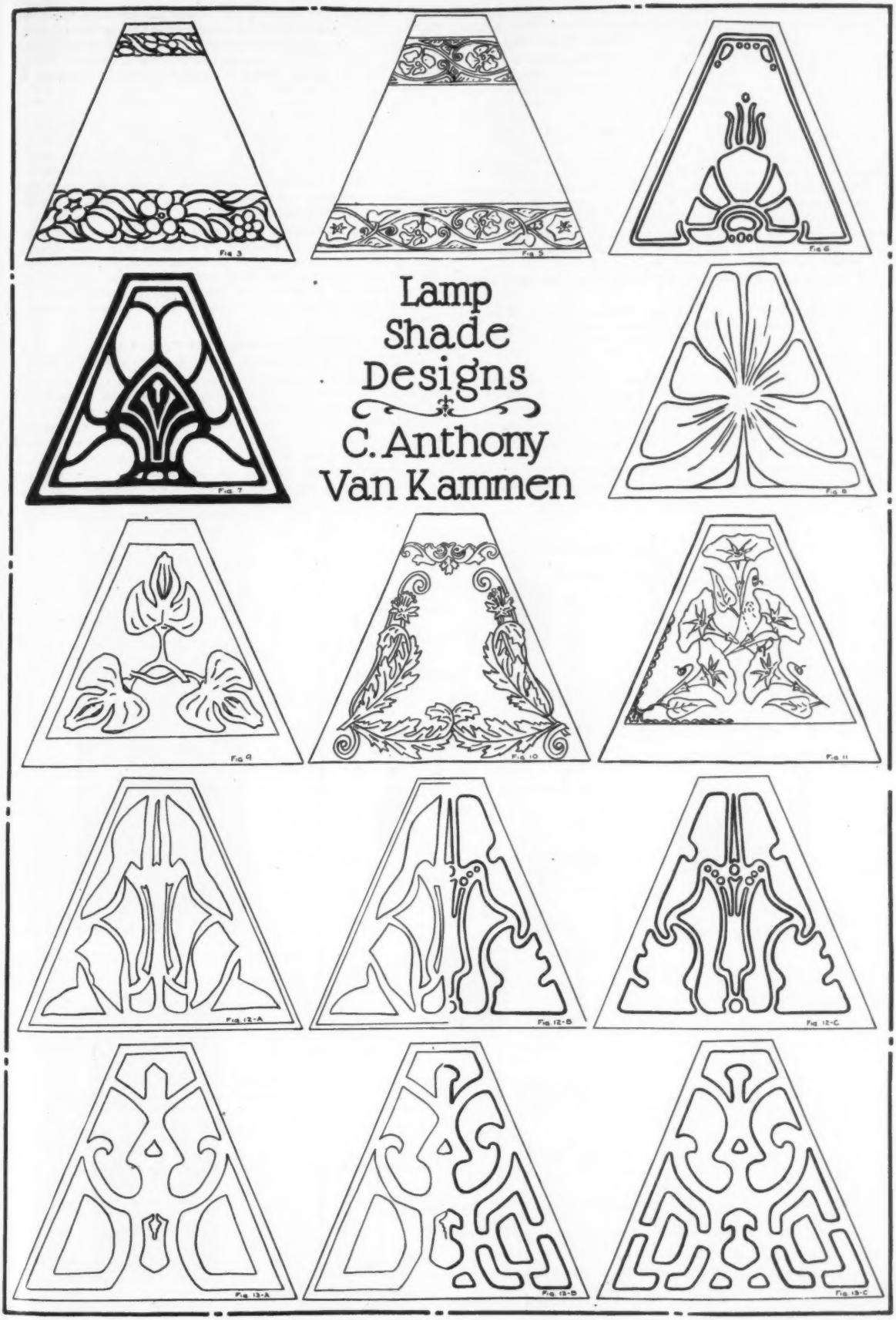


Fig. 3
Fig. 5
Fig. 6
Fig. 7
Lamp
Shade
Designs
C. Anthony
Van Kammen
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12-A
Fig. 12-B
Fig. 12-C
Fig. 13-A
Fig. 13-B
Fig. 13-C

left-hand side the design appears as a ribbon effect and with this in mind the space occupied by the D-shaped unit is filled with a similar ribbon treatment, as shown at the right. (Fig. 13B.) The little pendant in the lower central space does not appear a part of the broad treatment of the rest of the design and is best removed. The upper space is a little too angular and straight lined and is improved by the curves shown. Both designs 12C and 13C are suitable for sheet-metal or cardboard shades with a transparent material as colored glass, silk, or tracing paper for the background.

The design shown in Figure 6 is simple in treatment. The unit which is abstract resembles that of a flower form and is placed on the central axis with the point of interest at the lower edge. From this point there is a rhythmic movement of the space divisions to the large upper-central spot. The curved parallel lines formed by the sides of the adjacent areas, producing the fan effect, all seem to radiate from the center or point of interest to the top of the shade. Further unity is obtained by the fact that the fan-shaped unit repeats the contour or general shape of the panel.

HOW TO MAKE LIGHTING FIXTURES FROM BOTTLES
Part I

C. M. Rice, North Junior High School, Everett, Wash.

"Here's a bottle and an honest friend!
What wad ye wish for mair man?"
Robert Burns

Shapes of the past.

Somewhere in the interior of a dingy junk store, the collector may look for a few barrels of assorted bottles. If he is diligent, he may be rewarded with the discovery of some bottles that show artistry in both color and design. If he is an enthusiastic collector, the dusty shapes and tints will hold all of their old-time grandeur.

Light and Rejuvenation.

The enthusiastic collector, if he has a practical turn of mind, will seek ways and means of utilizing the artistic values that have been molded into the crystal forms. Many shapes will be found that can be turned into lighting fixtures very readily, as shown in the illustrations. The low-ceiling lantern (Fig. 1), as well as the lanterns shown in Figures 2 and 3, suggests uses for colored bottles. The two pendant fixtures, Figures 4 and 5, suggest a different treatment for bottles that are not stained.

Materials and Methods.

Materials that will be found useful in making the fixtures are as follows: Sheet brass or black iron; small brass or iron rods; button-head rivets, and 12-oz. tinners' rivets; (the button-head rivets may be shortened with a hack saw) stove bolts; ⅛ in. of gas pipe; fixture chain and loops; canopy switches; glass pendants. Useful tools are: a set of pipe dies, a soldering outfit, and an electric spot welder for welding vents on the hoods of lanterns, etc.

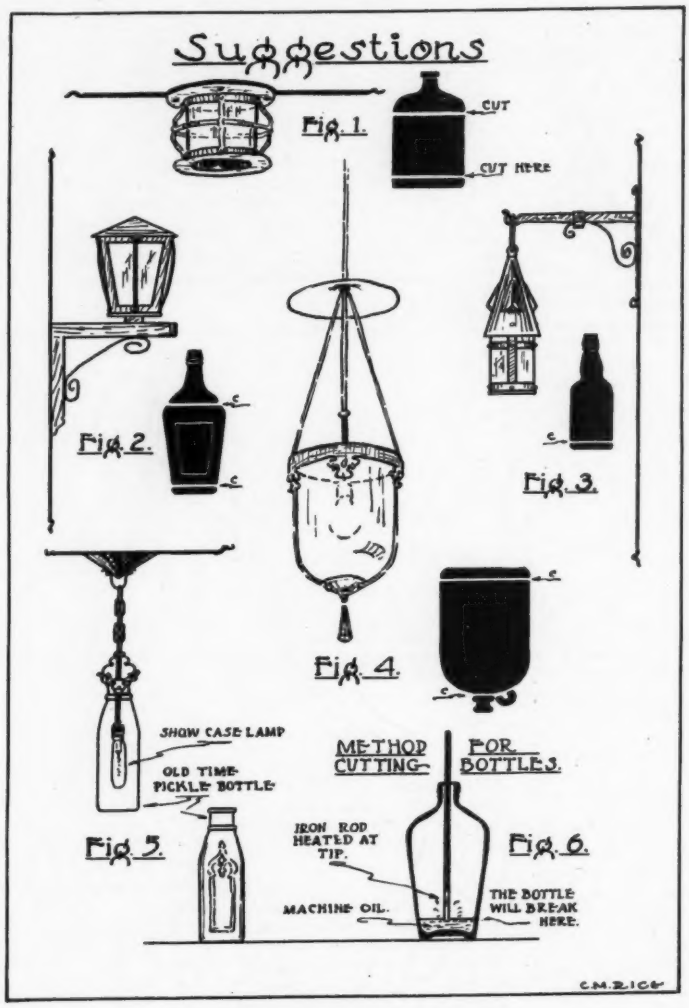
In cutting the bottle in one or more places, the method suggested in Figure 6 will be found satisfactory for making clean cuts. Machine oil is poured into the bottle until the liquid reaches the desired point. An iron rod, heated at the tip, is thrust into the oil. If both ends of the bottle are to be cut, the bottom may be removed first and then the neck should be corked and the bottle inverted in order to remove the top.

WOODBOX FOR THE FIREPLACE

Ross C. Cramlet, Lineville High School, Lineville, Iowa

The woodbox illustrated herewith was designed to take its place beside the fireplace and to add a touch of homelikeness to the hearth. It is a very suitable project for the ninth-year student, and it is very popular where the need for it exists. Walnut, oak, or cherry are suitable for this project, although gum or softwoods may be used.

The construction of this project is very simple. First, the pieces should be built up and cut to dimensions. The next step will be to make a pattern for the top of the back and sides. This



BOTTLES USED FOR LIGHTING FIXTURES.

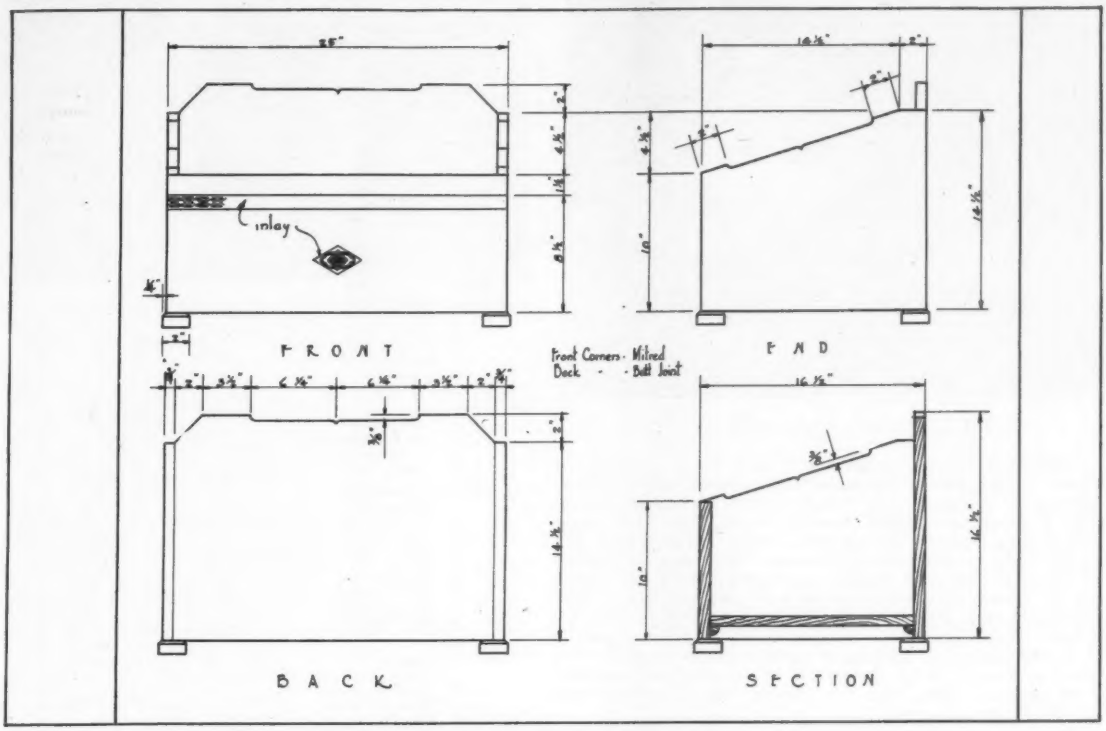
LANTERN FROM LIQUOR BOTTLE.

PICKLE BOTTLE.

may be laid out on a piece of thin material, and traced free-hand. After the pattern has been transferred to the back and the sides, it should be sawed out on the band saw.

The next thing is to cut the joints. At the back, plain butt joints are used and they are fastened with glue and screws. The front corners are mitered and fastened with glue. A triangular strip is placed on the inside to reinforce the corners. These strips are fastened with glue and screws, the screws being set at an angle so as to go into the front and end pieces. Near the bottom of the box, angle irons may be fitted in all the corners to take the strain which is produced when heavy pieces of wood are thrown into the box.

The blocks under the corners should be fastened from underneath with countersunk flat-head screws.



WOODBOX DESIGNED BY ROSS C. CRAMLET.

The inlays in the front are placed with a Stanley "Forty-Five" plane and a pocket knife. These add an artistic touch to the front and make the project appear more like a piece of furniture.

After the project has been thoroughly scraped and sandpapered, the wood should be stained and filled. Clear lacquer or a good varnish should be used as a finish, to withstand the rough usage which the box receives in use.

BATTERY CONSTRUCTION, MAINTENANCE, AND REPAIR

Stephen Hurtuk, Waite Senior High School, Toledo, Ohio

Higher quality, better value, and moderate prices are the things that have made the American automotive industry pass well into the lead of all manufacturing fields in the last two years.

The day of automotive inventions is not passed, however, and there is constant striving for improvement that will better the operation, service, and performance of the car. These factors depend to a large degree upon the battery.

Starting and lighting of the automobile would have been practically impossible without the storage battery, and the small generator to charge the battery. When storage batteries were first used in automobiles they were used for lighting and ignition only; later the electric starter was applied.

Of all the types of storage cells the lead storage battery has certain characteristics which make it better suited to the requirements of starting and lighting equipment.

The number of cars in use this year will be greatly in excess of last year, and the radio has added materially to the demand for batteries and recharging service. That automobile and radio battery construction, maintenance, and repair can be successfully taught in the high school is being demonstrated at Waite Senior High School, Toledo, Ohio.

Two periods are devoted to this specialized battery class each day, the remainder of the time being devoted to auto mechanics. The class consists of twenty boys and three girls, all of whom have had auto mechanics for two semesters. A brief description and outline of the battery course follows:

The first instruction is given with the class grouped around the cut-out section of a battery. The instructor points out and names the various parts, explaining their function and relation to each other. These introductory lessons deal, in a general way, with construction and function as a unit.

Very early in the course, the student performs the operation shown in Figure 1, that is, pouring the lead parts which enter into the construction of a storage battery. These are posts, cell connectors, nuts, lead-burning strips, and lead- and antimony-burning strips.

The greatest care must be taken to procure the proper antimony content, because if too much antimony is used, the castings are apt to crack or break, and if too little is used, the castings may not have sufficient strength. It is absolutely necessary that the metal be kept at a constant temperature to obviate what is known as "cold shorts." These consist of improper filling out of the casting.

The molds demand constant attention to see that the two halves are kept in alignment, in order to eliminate fins between the molds. Castings are carefully inspected, and those that are rejected are reclaimed and used for practice.

"Lead burning" is the fusing of lead without the aid of other metals. There are three types of burning equipment which the student learns to use: acetylene gas and oxygen, natural gas and oxygen, and acetylene gas and air under atmospheric pressure.

Figure 2 shows equipment and method used in burning one group of plates with natural gas and oxygen. Figure 3 shows equipment and method in burning three groups with acetylene gas and oxygen.

After the groups have been burnt they are ready for assembly. This process may be seen in Figure 4. Here the student is seen inserting wood separators between two groups, this being one of the first steps in assembling the elements of this 17-plate battery under construction.

The elements are then placed in the container and a solution of electrolyte is added, followed by cell covers and vent plugs.

Sealing the battery is the next step. The sealing compound used on batteries must be exactly right, must have good adhesive properties, must not crack under normal service conditions, and must be neither too hard nor too soft at varying temperatures.

After the sealing process, the cells are joined together with cell connectors which are burnt to the post.

There are two methods of charging in use in this shop: (*a*) constant current, and (*b*) constant potential, or constant voltage.

FIG. 1. POURING LEAD CASTINGS.

Constant current is maintained at normal rate by adjusting the rheostat, cutting out or decreasing the resistance as the charge progresses. This increases the voltage impressed upon the battery. Figure 5 shows the constant potential in operation. The motor generator is the 3-bearing type, a 40-deg. motor connected by a solid coupling to the constant-potential generator. Both units are mounted on a hot-rolled base. The charging panel has a 75-amp. meter which gives the amount of current taken by each individual battery when placed on charge. A voltage of 7.5 volts is maintained across the bus bars. Resistance clips are placed in series whenever necessary

By this method of charging, no power is lost by resistance, time is saved in charging, and it requires less manipulation and supervision by the instructor whose time and attention may be utilized more efficiently elsewhere.

The final step in the process is the testing of the finished product. Every new battery is placed on a high-rate carbon discharge, and it must deliver its rated capacity according to the rating established by the Society of Automotive Engineers, which is as follows:

"The rating shall indicate starting ability and shall be the rate in amperes at which the battery will discharge for 20 minutes continuously to a final voltage of not less than 1.65 per cell. The temperature of the battery beginning such discharge to be 80 deg. F. This rating would correspond to the roll-over current of a motor."

The battery course offers instruction on live jobs. Each battery must go out and give service in the hands of its owner just as if it had been built in a regular battery shop. It is true that these beginning students cannot at once be turned loose on commercial jobs. They must get their initial experience on units belonging to the school shop. After a short time, they can be allowed to do some simple commercial job which fits in with the instructional program. Of course, all work must be carefully inspected by the instructor.

The experience of our shop has been that there is as much demand for the repair of radio and automobile batteries as the building of new ones, and these repair jobs receive the same careful attention as the new product.

There is always present a shop atmosphere rather than a classroom atmosphere. The class is held responsible for the appearance and cleanliness of the shop, the care of tools, etc.

A set of job sheets were evolved in an attempt to solve the problem of individual progress and individual differences. These sheets take this form:

Name of Job
Objective
Tools and Material
Sketch
Operation
1.
2.
3, etc.
Questions
1.
2.
3, etc.
References
Information
Safety

These sheets are slipped into a celluloid case which protects the sheet itself and permits the student to handle it conveniently.

An outline of the course in battery construction, maintenance, and repair, as taught at Waite Senior High School, follows:

Outline of Course in Battery Construction, Maintenance, and Repair

A. Purpose
B. Principal parts
   1. Plates
   2. Separators
   3. Electrolyte
   4. Jars
   5. Covers
   6. Cell connectors
   7. Case
C. Construction
D. Raw material
   1. Lead oxide
   2. Lumber
   3. Pigs of lead
   4. Acid-proof paint
   5. Sealing compound
   6. Sulphuric acid
   7. Antimony
   8. Rubber products
E. Manufacturing process
   1. Lead smelter
   2. Molding lead grids and parts
   3. Pasting the plates and drying
   4. Forming and cutting
   5. Electrolyte
   6. Assembly
   7. Charging
F. Electrolyte
   1. Composition
   2. Level of solution
   3. Specific gravity
   4. Freezing points
G. Electrical measurements
   1. Ohm's law
   2. Volt
   3. Ampere
   4. Ohms
   5. Watts
   6. Kilowatt
   7. Horse power
   8. Ampere hours
   9. Watt hours
H. Charging
   1. Purpose
   2. Types
   3. Kind of current used
   4. Chemical action
   5. Polarity
   6. Rate of charge
   7. Safety
I. Tests
   1. Hydrometer
   2. Capacity
   3. Cadmium
   4. High-rate discharge
   5. Temperature
   6. Open-circuit voltage
   7. Closed-circuit voltage drop

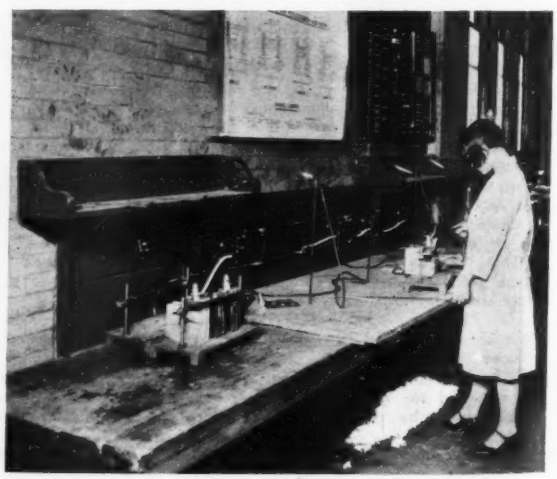


FIG. 2. BURNING PLATES WITH NATURAL GAS AND OXYGEN.

FIG. 3. BURNING PLATES WITH ACETYLENE GAS AND OXYGEN.

8. Defective burning
9. Precautions

J. Condition
1. Cleanliness
2. Overheating
3. Undercharging
4. Corrosion at terminals
5. Low capacity
6. Leaky jars
7. Symptom—cause—remedy

K. Electrical symbols

L. Definitions of terms frequently used in battery work.

M. Testing equipment
1. Ammeter
2. Voltmeter
3. Cadmium test terminals
4. High-rate discharge tester
5. Hydrometer
6. Thermometer
7. Tungar rectifier
8. Precautions

N. Circuits
1. Series
2. Parallel
3. Combination

O. Rebuilding
1. Opening batteries
2. Eliminate sediment
3. Eliminate short circuits
4. Test jars for leaks
5. Burning plates
6. Assembling elements
7. Inserting separators
8. Replacing broken jars
9. Replacing damaged battery cases
10. Washing and pressing
11. Inserting elements in jar
12. Replacing cell covers
13. Sealing compound
14. Burning connectors
15. Burning terminals
16. Cleaning and painting
17. Charging
18. Testing
19. Precautions
20. Safety

P. Shop management
1. Arranging shop equipment
2. Preparing bills of material
3. Making out time cards
4. Ordering material

Q. Care of a storage battery

R. Care of apparatus

FIG. 4. ASSEMBLING 17-PLATE BATTERY AT MORRISON R. WAITE SENIOR HIGH SCHOOL, TOLEDO, OHIO.

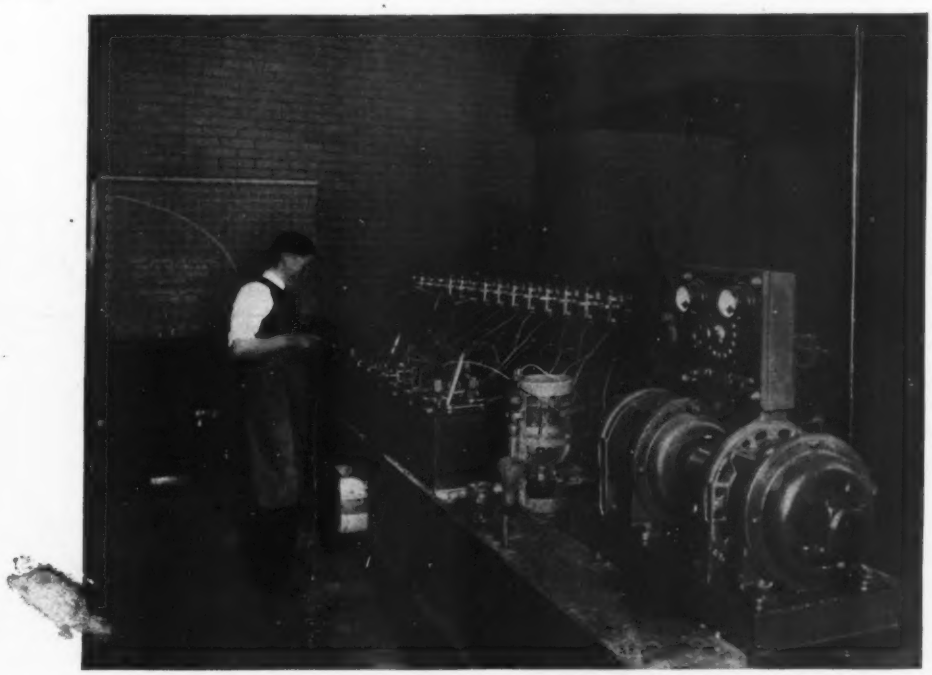


FIG. 5. CHARGING BATTERIES WITH CONSTANT POTENTIAL, MORRISON R. WAITE SENIOR HIGH SCHOOL, TOLEDO, OHIO.

A LIVING-ROOM STOOL

John Y. Dunlop, Greenfield, Tollcross, Glasgow, Scotland

The problem described herewith does not require the use of any machine. It is a project which any boy with a good working knowledge of tools can make.

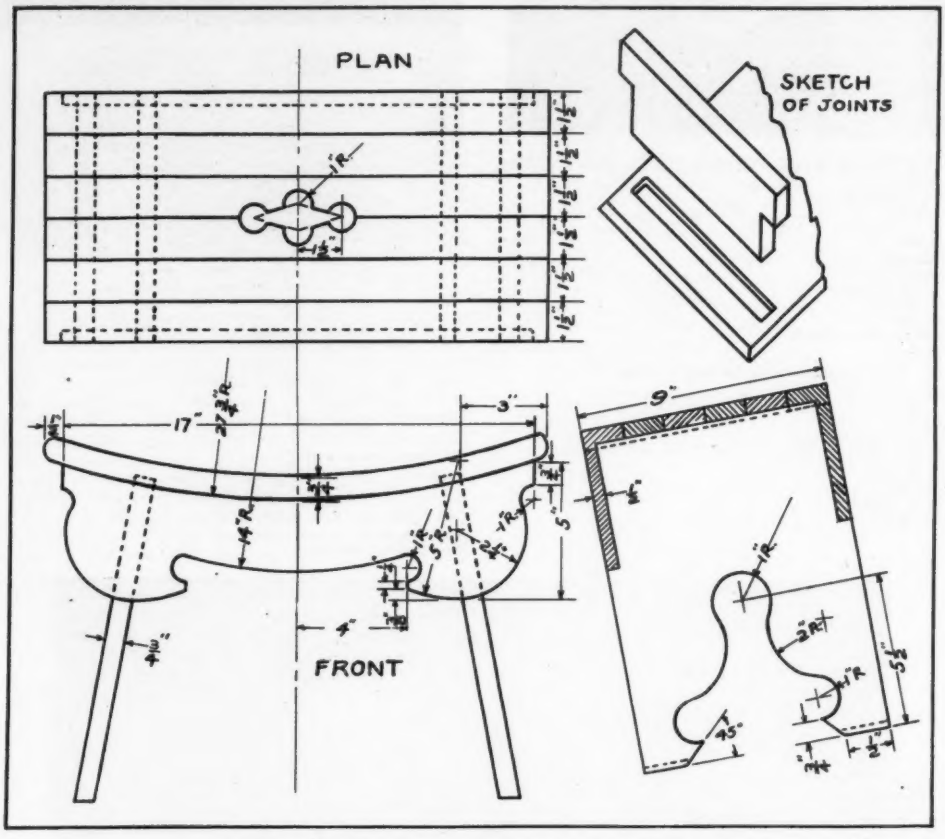
We used oak, but the stool can just as well be made in some of the popular softwoods and when finished, it should receive a coat of stain shellac and three coats of good rubbing varnish.

The leg and side designs were first sketched on heavy paper. They were then transferred to the wood, after which the perforations were cut out. Then the shaping of the parts was commenced.

The design of the parts may be changed, and students should be encouraged to work out their own designs, thus adding a little originality and increasing the interest.

The upper surface of the top was cut first and finished with a spokeshave, then the thickness line was drawn, and the lower curve cut.

The joints were glued. After they had dried, the notches for the legs were cut out.



LIVING-ROOM STOOL DESIGNED BY JOHN Y. DUNLOP

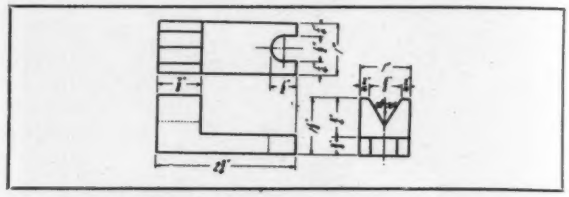
This problem boosted the interest of my boys almost a hundred per cent in woodwork and after they had seen that it was not beyond their ability to make neat pieces of furniture, they at once wanted to start larger projects.

FIRST-YEAR MECHANICAL-DRAWING TEST NO. 4

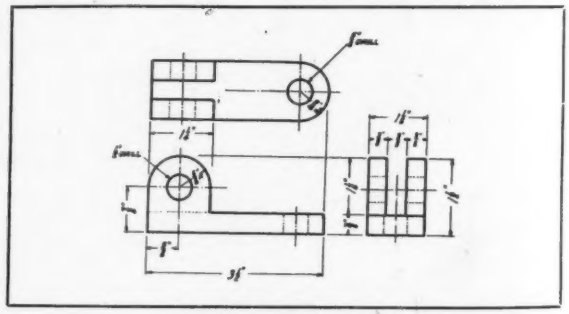
August Flam, Los Angeles, California

Directions: Read each statement carefully: If it is true, write *True* in the parentheses at the end of the statement. If it is false, write *False* in the parentheses provided.

1. An isometric line is one upon which measurements may be laid off in making isometric drawings... ( )
2. Circles in isometric projection appear as true circles ..... ( )
3. An angle in isometric projection is not reduced from or increased above its true magnitude..... ( )
4. In isometric projection the size of the figure drawn undergoes a slight increase..... ( )
5. The greatest value of isometric projection lies in that it enables one to show clearly all invisible surfaces.. ( )
6. Isometric drawings are not as a rule used in making details of parts in modern drafting rooms..... ( )
7. In oblique projection the front view of the figure is usually reproduced without distortion..... ( )
8. None of the axes in oblique projection are at right angles to each other..... ( )
9. Make an isometric free-hand sketch of the figure below:



10. Make an oblique drawing of the figure below. Use instruments; scale: 12 in. = 1 ft.



CHECKING LIST
For Test No. 4

1. True	3. False	5. False	7. True
2. False	4. True	6. True	8. False

9 and 10 are drawings

USEFUL INFORMATION ON ROOFS AND ROOF CONSTRUCTION

J. F. Faber and Fay Daley, Erie, Pa

(See Supplement No. 104)

Frequently, questions arise in architectural-drafting classes as to what pitch of roof to use, how the pitch is obtained, what types of roofs are used, and what the names of the various parts of the roof are. The chart on "Useful Information on Roofs and Roof Construction" was arranged to answer these questions.

The illustration showing the different parts of a roof such as hips, valley, common rafter, jack rafter, etc., should not only prove of value to the drafting student, but the carpentry-shop student as well.

The dormer was included so that the student may get an idea as to what a dormer really is.

SIX-INCH DIVIDERS

W. P. Childs, Alhambra, California

(See Supplement No. 105)

The project described herewith furnishes a variety of operations at a very small material charge. The skill required to make these dividers is well within the capacity of boys in the eighth, ninth, and tenth grades.

The legs and spring are made by filing in the junior-high-school shop, but in the senior-high-school shop, these parts are machined, using fixtures, jigs, and dies. The other parts of the dividers are made on a small lathe or on a bench lathe and drill press. For the trunion posts, it is best to make a small drill jig to crossbore the holes, although they can be laid out and drilled with jigs. The material used is either 1020 S. A. E. steel or .80 carbon tool steel. This can be procured in bars ⅛ by ⅜ in. from any steel supply house or direct from the mill.

The design for the 6-in. dividers can be readily changed so that it is suitable for the making of 6-in. inside, and outside calipers.

MUSIC RACK FOR SCHOOL USE

Claude L. Kulp, Director of Industrial Arts, Ithaca, N. Y.

(See Supplement No. 106)

To overcome the annual repairing of music racks, the one described herewith was designed. It is made very substantial and will stand quite a bit of abuse.

The project lends itself very readily in coordinating the work of different departments, as it involves drawing, cabinetmaking, patternmaking, foundry work, and machine-shop work.

Since the illustration which shows the details of the music rack is practically self-explanatory, no further directions for assembling need be given.

LOCKS, SEAMS, AND JOINTS USED ON ROOFING AND CORNICES

J. F. Faber and Harry Anderson, Erie, Pa

(See Supplement No. 107)

The chart on locks, seams, and joints used on roofing and cornices was drawn especially for sheet-metal trade classes. It shows how the seams and joints are formed and where they are used.

ACCURACY

C. C. Hermann, Moline, Illinois

The young man who leaves the manual-training school to enter industry, finds a hard road ahead of him. His schooling thus far has done little more than teach him the correct use of the various tools and machines. The actual work accomplished in the school-room was necessarily of an elementary nature, and although it has replaced a similar amount of preliminary study which would otherwise be required of the boy in completing an apprenticeship in industry, yet it cannot be considered as entirely eliminating the necessity of an apprenticeship. The boy is very apt, therefore, to feel discouraged when, upon entry into industry, he finds that he is not at once put at work which is of some importance.

In writing this article, the writer has in mind the connecting link between the manual-training school and the machine shop; namely, the question of accuracy. The subject of gauge making will probably best illustrate what is meant. Before entering directly upon the subject of accuracy, it might be well to explain briefly the classification and function of gauges.

A gauge is, specifically, a standard of comparison. The United States leads the world in the matter of duplicate manufacture. This is because the American manufactures, rather than builds. Built articles are costly since they involve the individual forming, shaping, and fabrication of each part, of a completed machine. Manufactured articles are low in cost because hundreds and thousands of a single element are made in rapid succession and from the same tool assembly. Since this method of production precludes the fitting of the adjacent elements of a machine, it becomes necessary to provide some standard of comparison for the elements, to insure their fitting when they are assembled. Just as large quantities of elements are produced in duplicate, so large quantities of machine parts or small groups of elements are produced in duplicate. The assembled parts are in turn placed together to make up the complete machine, and here again we must have the proper fits between the parts to insure the correct functioning of the parts in the assembled whole. The fact that the elements fit properly in the assembled part and that the assembled part fits and functions properly in the completed machine is not a coincidence. Instead, it is the product of very carefully planned methods of manufacture. It requires untold study and an enormous outlay of capital to bring it about. It requires an accuracy peculiar to the machine at hand. It requires a coordination of machinist skill and metallurgical knowledge subordinated to designers skill in establishing the limitations of accuracy. For example, the actual cost of producing an article to a dimension accurate within one-half thousandth of an inch, is three times as high as the cost of producing an accuracy of two thousandths of an inch.

Gauges are divided into two general classes. (1) Reference gauges, which at times are known as "master gauges," and (2) working gauges which are used daily in the production processes. A reference gauge is essentially a standard of reference and used only for the purpose of checking the working gauges occasionally to determine their relative accuracy. It is not difficult to understand that a working gauge, after testing a large number of pieces, is no longer accurate. Although hardened to reduce the wear which comes upon the gauging surfaces, yet considerable wear does take place, and after a time the gauge becomes too inaccurate to be suited to the purpose for which it was made. The limits allowable in the wearing of a gauge before declaring it unsuited to the purpose must be determined. Otherwise considerable investment would be wasted either in the unnecessary renewal of costly gauges, or in spoiled product of manufactured parts too inaccurate to be of any use.

It is easily seen therefore, that the reference or master gauge is not intended to be used on the pieces as they pass through the shop. Instead they are kept in a safe place, protected from fire and theft, and used only for testing or reproducing the system of working gauges that are used on the actual work.

The working gauge, as may be deduced from the foregoing, is intended for use in testing the product of manufacture or tools of manufacture. They are made in various shapes and sizes. Many are extremely complicated while others are comparatively simple. Working gauges also may be divided into two classes namely, those which are intended to preserve a given form or contour, and those which are intended to preserve a given dimension.

There is another important division of gauges which must be taken into consideration. In industry we have a large number of gauges which are used to establish a mean dimension for a given piece or element. Such gauges are known as limit gauges and consist of two gauges, one of which limits the largest dimension, and the other the smallest dimension of the given piece. Another class of gauges do not take into consideration any variations from the standard that has been set. Such gauges are provided to establish certain linear dimensions, angles, etc., and are known as definite gauges, because they gauge a single dimension only.

Now that we have learned something about gauges in general, and about their purpose and classification, we can more readily appreciate the accuracy which must be worked to in gauge making. This phase of the work is of utmost importance and the first step to determine is the accuracy necessary in the finished work. The next step is to select measuring instruments which will provide this degree of accuracy. This entails some knowledge of the instruments available in the machine shop.

It is taken for granted that the measuring instruments which are available are made by some reputable manufacturer and that they are reliable. For an accuracy of two thousandths of an inch plus or minus, which means that the article may be either two thousandths under or over size, the graduated steel scale may be used. This variation may be two thousandths of an inch under the actual dimension on one piece, and two thousandths of an inch over the actual dimension on another or it may lie anywhere between these points. When speaking of the accuracy, the term "limit of accuracy" is usually used. This limit of accuracy in connection with the graduated scale is two thousandths of an inch.

Where the limit of accuracy is to be under two thousandths of an inch, some other measuring instrument must be used. The limit of accuracy of the vernier caliper is usually considered to be one half of one thousandth of an inch, giving a total variation of one thousandth of an inch. A limit of accuracy less than this requires measuring devices of a high order. With the vernier micrometer, if kept in first-class condition and frequently tested by standard end-measuring pieces, reference disks, etc., the total variation can be kept down to within one thousandth of an inch. Beyond this limit, the micrometer is found to be unreliable and recourse must be had to standard bench measuring machines. In such machines, the sense of touch of the mechanic is replaced by a contact piece, making it possible to reduce the limit of accuracy to .00002 in. Such accuracy is rarely required in gauge making of the ordinary order. The limit of accuracy of the bench measuring machine is ordinarily taken as the commercial limit of accuracy. Striving for accuracy greater than this makes the cost practically prohibitive.

From the foregoing, it can be readily seen that the toolmaker must guard against needless accuracy as much as he must avoid pro-

ducing work which is very inaccurate. Reducing the limits of accuracy increases the cost of production very rapidly. A few examples regarding commercial practices will probably make this point clear. A steam-engine cylinder, 30 or 40 in. in diameter would probably be accurate enough if the dimension does not vary more than .01 in. from the true dimension, whereas a 3-in. gasoline-engine cylinder must be ground to within one-half thousandth inch of the true dimension. A gauge to be used by a blacksmith may vary as much as $\frac{1}{16}$ in. and he will still be considered a good workman since he is working on comparatively rough material. The woodworker and patternmaker is required to work slightly closer, say $\frac{1}{32}$ in. on some work.

TAGGER-TIN PATTERNS

Horace M. Clark, Los Angeles, California

Successful work in some phases of manual education, depends a great deal upon the use of good patterns. This is particularly true of the toy work in lower grades and it applies to an almost equal extent in work with the larger projects for the older pupils. It should pass without argument that at least the same amount of care and attention should be devoted to the templates as is given to the various tools, jigs, and other appliances used in handwork. A dull chisel is worse than no chisel at all, for it may be an inducement to careless work. The same is true of a poorly made pattern.

It is possible to obtain good results with cardboard patterns. These are quickly and easily made, and are inexpensive. The principal fault to be found with cardboard or paper patterns is that they do not hold their outlines, and after having been used several times, especially by the younger pupils, they are practically unfit for further use, if accurate work is expected. In the course of a term's work it may be necessary to replace them many times.

Metal patterns are greatly superior to templates made from the less durable materials. In this case again there are disadvantages, particularly as to the time and effort necessary to make a good pattern of metal and as to the cost of the material. A number of manual-education teachers, however, have found it to the advantage of their work to use metal plates almost exclusively.

Occasionally, old tin cans are used for this purpose for the sake of economy. It must be said, however, that the making of patterns from this back-alley product is anything but an agreeable task. We venture the statement that any manual-education teacher who has ever undertaken the work of making a number of patterns from tin cans or even of tin plate of standard thickness has experienced a temporary lapse in his usually keen professional interest.

To make the job of preparing patterns easier for the instructor, tagger tin, also known to the metal trade as calendar tin, may be used. This material is a very thin variety of tin plate manufactured after the manner of ordinary tin, but rolled to possibly one third or one half of its thickness. It derives its name from having been used for labels, or tags. It is used in the manufacture of various novelties and also for the inner covers of vacuum-packed provision cans.

The comparative cheapness of tagger tin especially recommends it for our use. The cost in sheets of standard dimensions, 20 by 28 in., even when purchased in small quantities averages less than five cents per square foot. It is usually obtainable at the larger hardware stores and tin shops, but a wider selection may be found at the factories where metal containers are manufactured.

It is possible that even greater use is made of patterns in handwork in the lower grades than in manual education in grades above the primary, and it is in the primary grades that the sanitary question is frequently a matter of utmost importance. From an aesthetic, as well as a sanitary point of view, it is almost a necessity that every sort of device which is placed in the hands of the younger children be of material which may be easily cleaned and disinfected.

This peculiar advantage may be claimed for metal patterns over templates of almost any other material. Patterns of tin plate may be easily washed as often as is necessary and they will not rust if ordinary care is used in the drying process.

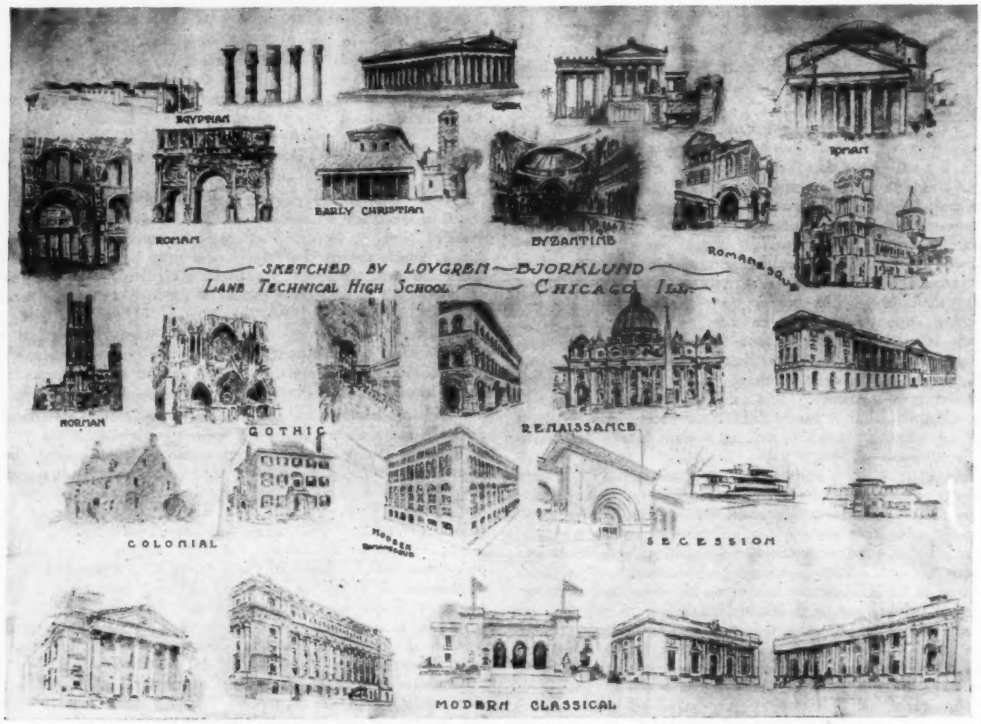
Tagger tin possesses sufficient strength and durability to make possible the sharp, distinct outlines necessary for good tracing. Although it is so thin that it may be cut with small scissors or even torn with the bare hands without great difficulty, it is tough enough that a template of this material is good for a long time.

In any or all of our educational means and devices, we must necessarily use great care that nothing is placed in the hands of our pupils in which there is involved even the slightest element of danger or possible injury. With regard to the patterns of thin tin plate it may be said that templates of this material have been used for the past two years in the manual-education room of the Clifford Street School without a single case of injury to even the most awkward juvenile finger.

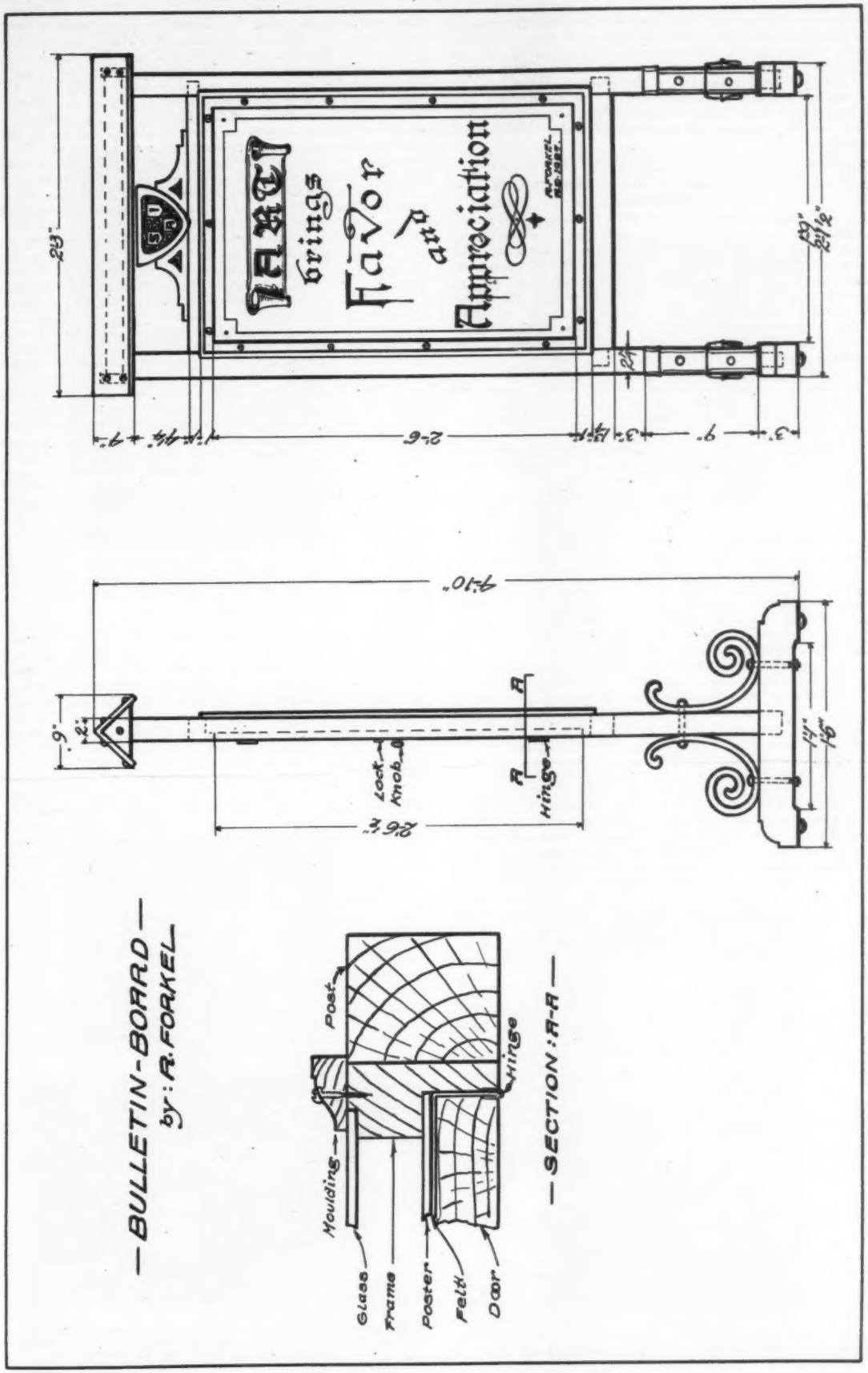
BULLETIN BOARD

R. Forkel, Instructor in Crafts, School of Industrial Arts Trenton, N. J.

The bulletin board described herewith was designed by the writer for the main entrance of the main building of the School of Industrial Arts, Trenton, N. J. It accommodates 20 by 30-in. posters.



TYPES OF ARCHITECTURE SKETCHED BY STUDENTS OF THE ARCHITECTURAL DRAWING CLASS OF LANE TECHNICAL HIGH SCHOOL, CHICAGO. MR. VALENTINE, INSTRUCTOR.



— BULLETIN-BOARD —
by: R. FORKEL

— SECTION: A-A —

It is so constructed that it is dustproof. For this purpose, the door is covered around the inside and edges with felt. The glass is placed into the frame from the front, laid in putty, and the molding, which holds the glass, is fastened with round-head screws.

The heraldic symbol adopted by the school, is fastened at the top of the inner frame as an ornament.

The iron-work brackets are the work of the wrought-iron class.

The board is constructed of quartered oak, natural finish, filled and varnished.

ASSOCIATION AND CONVENTION ACTIVITIES

THE VOCATIONAL-EDUCATION MEETING AT MINNEAPOLIS

The vocational-education section of the National Education Association held its annual meeting in connection with the general association on July 1, at Minneapolis, Minn. The vocational-education section is one of seventeen coordinate departments of the association, the others being adult education, the association of teachers' colleges, business education, classroom teachers, deans of women, elementary-school principals, kindergarten-primary education, music education, rural education, science instruction, secondary-school principals, social studies, superintendence, visual instruction, and the National Council of Education.

Nine meetings were held in connection with the session. Two meetings were in commercial work, conducted by the department of business education; two in home economics, by the American Home Economics Association; and one in vocational guidance by the National Vocational Guidance Association. Four others—a general vocational meeting, and sectional meetings in agriculture, manual arts, and trade education, were conducted in connection with the vocational-education department.

A feature of the week's program and of the special-subject plans was the display of school activities and classroom products of the Minneapolis schools. The display was not the usual exhibit of students' work but rather a presentation of representative equipment, assignments, and indications of progress in vocational work.

At the general session, Miss Adelaide Steele Baylor, of the Federal Board for Vocational Education, talked on "The Home and Citizenship"; Dr. W. C. Coffey, of the University of Minnesota, discussed "The Relation of Agriculture to Educational Progress"; and Dr. R. L. Cooley of Milwaukee, Wis., took for his subject, "The Part-Time School and Vocational Education."

At the agricultural-education section, Mr. J. C. West of Bemidji, Minn., discussed "Educational, Economic, and Social Contributions of a Department of Agriculture in a School System"; Mr. A. M. Field, of the University of Minnesota, talked on "Mental Ability as a Factor in Instruction in Agriculture"; and Dr. Frank W. Lathrop of the University of Minnesota, took up the topic, "Tendencies in Agricultural Education."

At the manual-arts section, Mr. C. A. Bowman of Stout Institute, Menomonie, Wis., gave a talk. Mr. James A. Starkweather of Duluth, Minn., talked on "The Demands of Changing Industry upon the Schools," and Mr. H. J. Smith, of the University of Minnesota, discussed "The Five-Year Changes in a State Program."

At the trade-education section, Mr. W. W. Sturtevant of Minneapolis, Minn., talked on "A Survey of Actual Blue Prints from Industry as a Basis for Courses in Mechanical Drawing"; Miss Elizabeth Fish, of Minneapolis, Minn., talked on "Changing Industrial Conditions as They Affect Vocational Training for Girls and Women"; Mr. W. J. Bogan, of Chicago, Ill., discussed "Service Through Vocational Courses"; and Mr. K. G. Smith of Lansing, Mich., took as his subject, "A Non-Smith-Hughes Plan of Industrial Education."

The new officers elected for the year were as follows:

President, Mr. Homer J. Smith, associate professor of industrial education, University of Minnesota; vice-president, Mr. Paul Chapman, state director of vocational education in Georgia; secretary, Miss Enid Lund, state supervisor of home-economics education in Ohio.

At the same time, three members were appointed to represent the department of vocational education on the National Council of Education. These are Miss Green of Pennsylvania, who will serve for two years; Mr. Painter, of Minneapolis, for four years; and Mr. Wahlstrom of Chicago, for six years.—*Homer J. Smith.*

SEVENTH ANNUAL CONFERENCE ON PRINTING EDUCATION AT CARNEGIE INSTITUTE OF TECHNOLOGY

The seventh conference on printing education was held June 25 to 27 at the Carnegie Institute of Technology, Pittsburgh, Pa.

At the opening session on the second day, Mr. Fred Hartman read a number of letters from printer-teachers who were unable to be present at the conference. Mr. J. C. Heinike, of the Elm Vocational School, Buffalo, N. Y., held that there should be but one school publication each year and that this should be the school yearbook. Mr. W. L. McChain, editor of "Printing," declared there should be a fresh note in printing. Taking as his subject, "Keeping up to Date," Mr. McChain gave many valuable suggestions relative to material and where it may be secured for use in teaching printing to students. Mr. E. C. Gress, editor of "The American Printer," in his paper, "Sketches and Impressions," described a trip through Europe and illustrated some of the modern ideas applied to printing. He showed that more color is used than formerly when the printer had only one quart of ink in his possession. Mr. E. E. Vosburg, of the McCall Continuation School, Philadelphia, Pa., described the possible activities of a part-time school in printing instruction. Eight trips are made each year to printing plants of the city, and the boys later write up the results of the trip. Production work is reduced to a minimum and one rush job is permitted during the year. Mr. J. E. Mansfield of Wentworth Institute, Boston, held that the three great problems in printing education are: How to make instruction effective; the problem of production and instruction; and how to attract the best men to the profession. Mr. Vosburg pointed to the need of thoroughness in printing instruction and made a special mention of the pioneer printer-teacher, Mr. Stuart of Wentworth Institute. Dr. G. D. Whitney, of the University of Pittsburgh, reviewed the educational problems in printing instruction. He discussed the amount of skill and accuracy necessary in teaching printing, the kind of teacher to be employed—whether tradesman or teacher, the need for teaching printing, the amount of time to be spent by the apprentice in the classroom, the amount and kind of equipment for the printshop, and other pertinent problems. Mr. Allan Robinson, of the Merganthaler School of Printing, Baltimore, Md., discussed the testing movement in the field of printing, stressing the need of a trade test to indicate the general knowledge of the student concerning the trade. Mr. Robinson gave examples of the various tests as used in his school. Dr. W. B. Jones, of the Department of Research in Higher Education, described the trade tests used in industrial work. Mr. J. Orville Wood outlined the professional preparation of the printing teacher as it is carried out in the Pittsburgh schools. Mr. F. T. Denman discussed blue prints for printers and showed a number of sketches illustrating the advantage of blue prints in connection with printing. Mr. C. W. Sylvester of Baltimore, Md., talked on the subject, "The Printing Curriculum," calling attention to the need of fundamental information and stressing the details of spacing. Mr. E. E. Sheldon, of the Lakeside Press, Chicago, Ill., gave a summary of the conference at the conclusion of each day's sessions.

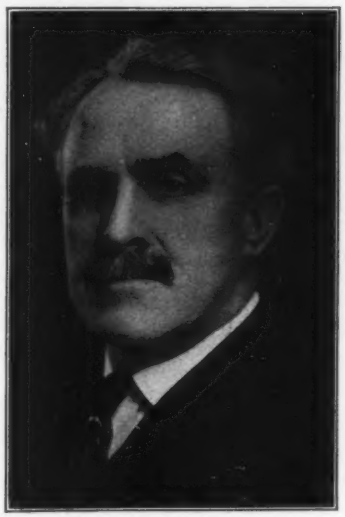
Mr. Frank J. Hartman, director of the Department of Education of the United Typothetae of America, Chicago, Ill., in his opening remarks before the conference, showed how the printing industry recognizes the importance of an education for its own good and for the good of those it serves, and stressed the fact that education is responding to the industry-wide interest in education. He pointed out that today printing is recognized as a leading branch in vocational education in all types of schools from the higher grades of the elementary school to the university. One tangible result of the industry and organized education, as brought out by Mr. Hartman, is that there is no longer any concern on the part of industry as to the source of its apprentices. A few years ago the most pressing problem in the industry was that of apprenticeship, while today more and better trained apprentices are coming into the industry than was ever possible in the past. Craftsmen with a broad knowledge of the craft and office enter the industry with a training in management and salesmanship to meet the modern needs. Mr. Hartman made a mention of the movement recently inaugurated by the Department of Education to create an interest among printers to read and make use of books on printing as working tools for the industry. He stressed particularly that the Typothetae program of education is related closely with the program of organized education so that it does not interfere with academic freedom in any sense. It is the purpose of the industry to supply source material so that the educator may adapt his teaching program to it. It is not the purpose of the industry to control education but to supply the data and cooperation that shall make industrial education effective.—*George C. Donson.*

WORK MADE BY STUDENTS UNDER THE DIRECTION OF PROF. W. H. VARNUM, IN THE COURSE OF APPLIED ARTS AT THE UNIVERSITY OF WISCONSIN

MR. BOGAN ELECTED HEAD OF CHICAGO SCHOOLS

The election of Mr. William J. Bogan as superintendent of the Chicago schools is an honor which the friends of the new superintendent feel has been rightly bestowed.

Mr. Bogan has always been an ardent advocate of industrial education, and his work at the Lane Technical High School of Chicago has given him international fame.



MR. WILLIAM J. BOGAN
Superintendent of Schools,
Chicago, Ill.

Mr. Bogan is a native of Michigan. He holds the Ph.B. degree given by the University of Chicago, and has been teaching since 1889. He was first assistant superintendent while William McAndrew was at the head of the Chicago school system, and has been acting head for the past nine months.

The friends of industrial education congratulate Chicago on their choice of William J. Bogan to head their large school system.

ELECTED PRESIDENT OF THE VOCATIONAL-EDUCATIONAL SECTION OF THE N. E. A.

Dr. Homer J. Smith, associate professor of industrial education of the University of Minnesota, on July 1 was elected president of the vocational-education section of the National Education Association.

DR. HOMER J. SMITH
President, Vocational-Education Section,
National Education Association

Dr. Smith is a graduate of the Platteville Normal School. He received his Ph.B. degree from the University of Wisconsin, and M.A. and Ph. D. degrees from the University of Minnesota. He was for six years vice-principal of the Boys' Technical High School, Milwaukee, and during this period was an evening-school instructor in the extension division of the University of Wisconsin. Since 1919, Mr. Smith has been a member of the faculty of the department of industrial education of the University of Minnesota.

Dr. Smith is president of the Minneapolis Vocational-Guidance Association and is the author of a number of publications concerning part-time teaching and industrial education. He is a frequent contributor to the educational periodicals of the day.

APPOINTED AS SUPERVISOR OF MANUAL ARTS

Mr. Manzer has recently been appointed as supervisor of manual arts at Bronxville, N. Y. The Bronxville school system is one of the leading systems in the east and the position is one that offers large opportunities for a high degree of supervisory service.

MR. EMERSON W. MANZER
Supervisor of Manual Arts,
Bronxville, N. Y.

Mr. Manzer was formerly with the extension division of the University of Wisconsin. He holds the degree of B.S., given by the University of Wisconsin and is completing graduate work leading to an M.A. degree. He is a frequent contributor to the professional literature in industrial arts.

SUPERVISOR OF MANUAL ARTS, GREENWICH, CONN.

Mr. Wenger, who was formerly assistant instructor of manual arts in the high school at Lebanon, Pa., has been appointed to the position of supervisor of manual arts at Greenwich, Conn.

(Continued on Page 30a)

MR. PAUL N. WENGER
Supervisor of Manual Arts,
Greenwich, Conn.

NOW, ARE THERE ANY QUESTIONS?

Finish for Door Knockers

815. Q.: After searching many books for a method of treating forgings, such as door knockers, in order to render them rustproof and yet avoid a painted effect, I am writing to see if you can help me out. There is a heat treatment in which zinc is used but how to do it is the question.—*E. W. K.*

A.: In treating metal forgings for door-knocker effects, I am going to suggest the following experimental formulas for your benefit. After all tooling, sanding, and other mechanical work is completed, one of the following dips may be used:

For bright dip:

Sulphuric acid	1 part
Nitric acid	1 part
Water	4 parts

Caution: Place a large crock or glass vessel on a rubber or carpet mat, and then pour the water into it. Then add the acid by allowing it to flow down a softwood stick or glass rod while the mixture is stirred constantly. This must be done with care as considerable heat is generated when the acid mixes with the water.

For satin dip:

Hydrochloric acid (muriatic acid)	1 part
Sulphuric acid	6 parts
Water	6 parts

The metal parts should be immersed in the dip for about 30 minutes. They must then be rinsed in boiling water, after which they are dried. To avoid contact with the hands, it is well to wire all pieces with annealed wire in such a manner that they may be easily handled. After the rinse they should be dried in a warm oven, avoiding any contact with the hands in the meantime. When the color is satisfactory, the work must be dipped in a dipping lacquer made for this purpose.

By giving these metal parts a copper plating as described for book ends on page 154 of the April, 1928, issue of the INDUSTRIAL-ARTS MAGAZINE, antique coppers, dark browns, steel grays, blacks, and iridescent effects may be secured as subsequent operations. In any case, the final coating should be either a gloss or dull dipping lacquer in order to protect the finish from the atmosphere and handling.—*Ralph G. Waring.*

What is Banana Oil?

816. Q.: Is "Banana Oil" that is used with bronze and aluminum paints, a commercial name or does it really come from the banana tree or the fruit, or what? We have been using some lately and one of the boys asked me what it is made of.—*P. S.*

A.: Banana oil is the commercial name of a preparation used as a vehicle for carrying the pigment in bronzing paints. Its composition varies somewhat. For instance, one formula states that it is composed of the following:

Amyl acetate	9 parts
Butyric ether	9 parts
Alcohol	1 part

Another formula gives the following composition:

Transparent celluloid, one avoirdupois ounce. Use enough acetone to dissolve this celluloid. Then add amyl acetate to make 20 fluid ounces.

It is the amyl acetate which gives the preparation the odor of bananas.

Table Tops

817. Q.: On page 269 of the July, 1927, issue of the INDUSTRIAL-ARTS MAGAZINE, was published a project on a dining table. Would there be danger of the top of this table warping if it was made of solid walnut? If this top was made of walnut veneer would it eliminate this difficulty?—*E. M. K.*

A.: Table tops made of solid wood are always apt to warp. It would be much better to have the material glued up in narrow strips. Walnut veneer if properly made will eliminate the warping.

Finishing Walnut Table Tops

818. Q.: Please tell me in detail how to finish a natural walnut table top so it will not be affected by hot dishes.—*E. M. K.*

A.: Sponge the completed cabinetwork with clean, warm water, let dry over night and then sand glass-smooth and free from all traces of scratches or other imperfections, using split 6/0 paper and a felt block. Apply a coat of water stain of the desired strength, and dry over night. Spray on a coat of clear finishing wood lacquer, repeating each three hours, and without sanding between coats, until three coats have been applied. Let dry overnight, sand smooth with a split 6/0 paper as in the first instance, dust off and then rub for finish with felt pad, FFF pumice flour and crude oil. Wipe clean with soft cloths containing a mixture of crude oil and gasoline, two to one.

In case a spray machine is not available, use stock orange or white shellac, reduced with denatured alcohol half and half, and then added as reduced above, to an equal volume of shellac mixing lacquer. This lacquer can be obtained from practically all varnish manufacturers. Apply the mixture with a fine-haired brush, such as a fitch or bear, and allow six hours or more between coats. If necessary dry sand between coats with old 6/0 paper. Rub with oil as directed for the spraying lacquer.

I am not recommending the hot linseed oil and turpentine method sometimes suggested for this work as the results are more imaginary than practical.—*Ralph G. Waring.*

Waterproofing Tents

819. Q.: I would like to know a simple and effective method of waterproofing an 8-oz. canvas tent. A liquid kind that could be applied with a brush. There is a kind called "Preservo" sold here in the stores. What is its composition? It requires about two gallons of this mixture brushed on while tent is up. It is quite expensive.—*C. M. D.*

A.: Products which bear trade names are usually compounded according to formulas which are not made public.

A waterproofing composition that can be applied with a brush, may be made as follows:

Dissolve soft soap in hot water and add a solution of iron sulphate. A chemical reaction will take place and the iron oxide is precipitated in the form of insoluble iron soap. This is then washed and dried after which it is mixed with linseed oil and can be applied with a brush.

Another method of waterproofing calls for a decoction made by boiling 1 lb. of oak bark in 14 lb. of water. This quantity will waterproof about 8 sq. yd. of canvas. The cloth is soaked in this decoction for 24 hours. It is then taken out, passed through running water, and hung up to dry. The fibers of the cloth absorb the tanin and thereby become waterproofed and at the same time strengthened to resist wear.

Lines on Gymnasium Floors

820. Q.: In some of our new school buildings, we are including gymnasiums, which necessitate lines to be painted on the wooden floors for the use of basketball games, etc. Can you suggest any method whereby these lines may be put on the floor in such a way that they will not wear off? One way might be to inlay in wood; or as I tried a few years ago, to cut out the floor and fill in with different color cement. This was not wholly satisfactory, however.—*F. E. B.*

A.: We have been experimenting with the placing of lines on gymnasium floors, trying out various ideas during the past ten years, but have failed, so far, to find any practical way of making them permanent. We have been unable to find any material made in a paint or varnish factory, which is able to resist the rough usage to which the usual gymnasium floor is subjected.

We intend to try cementing and bradding rubber flooring strips such as are made by the U. S. Rubber Co., of 1790 Broadway, New York City, into rounted-out grooves in the floor. After the cement has set, the floor will be machine sanded and the job will be ready to be tried out by the gymnasium classes. I doubt very much whether there is a plastic or other cement which can stand the wear and tear to which a gymnasium floor is subjected.—*Ralph G. Waring.*

STATE UTILIZATION OF FEDERAL FUNDS FOR VOCATIONAL EDUCATION

The Federal Board for Vocational Education, in its report for 1927, shows the percentage of Federal appropriations for vocational education used by the states, by years, from 1918 to 1927. It should be noted that during the first four years of the decennium the proportion of Federal funds used mounted steadily up to 92.4 per cent of the amounts which the states could have used under their allotments as determined by the national vocational-education act. From 1921 to 1923 this proportion remained almost stationary. From 1923 to 1925 there was a drop, partially owing to the establishment and enforcement by the state boards of vocational education of better standards, which brought about a period of readjustment with a corresponding lowering in the percentage of Federal funds available which were actually used, and partially owing to the fact that during that period Federal funds increased more rapidly than during the preceding years. Under these two sets of conditions, the states were unable to absorb Federal funds as rapidly as heretofore. From 1925 to 1926 the figure is practially stationary. For the year 1927, however, it shows a marked increase up to 93.6 per cent. There is every reason to believe that from now on the percentage will rise to a maximum, which will, however, always be less than 100 per cent.

Instructors in metal-working

There are many Stanley Tools for your shop

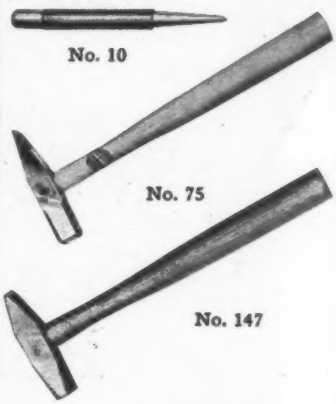
You need durable tools in your shop equipment. Stanley Tools have been known for years as tools of quality and have always been the standard of woodworkers. The tools shown here are a part of the largest line of hand tools on the market today, and should be of utmost interest to you.

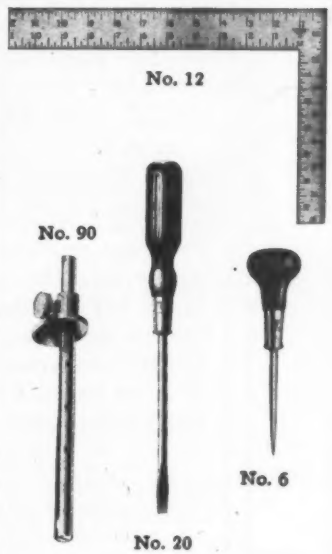
Send for our two catalogs. No. 34g shows the complete line of Stanley Woodworking Tools, Catalog No. 25g shows the complete line of Stanley-Atha Tools, including anvil tools and tongs for the forge shop.

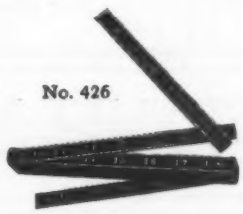
THE STANLEY RULE AND LEVEL PLANT
Educational Department, New Britain, Conn.

STANLEY TOOLS

STANLEY S.W.







See the Points?

Can you describe the "Point" of a twist drill?

Do you know what the "Dead Center" is?

Could you explain "Lip Clearance"?

Or "Margin" and "Body Clearance"?

These, and the answers to a dozen other questions, make the Handbook for Drillers the outstanding textbook on twist drills and drilling practice in America. The Handbook is now being used by several hundred vocational schools.

As our contribution to the cause of education in correct machine shop practice, we shall be pleased to forward to you any reasonable quantities of the Handbook for the use of your machine shop classes.

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(Continued from Page 341)

Mr. Wenger is a graduate of the Millersville State Normal School and holds an A.B. degree given by Albright College and a M.S. degree from Rutgers University. He is secretary of the Lebanon Manual-Arts Association and is a contributor to industrial-arts literature.

NEW BOOKS

Radio

By Elmer E. Burns. Cloth, 258 pages, 5⅜ by 7¼, illustrated. Price, $2.00. Published by D. Van Nostrand Co., Inc., New York City.

This textbook treats a difficult subject in a very interesting and enjoyable manner. Starting with directions for making a simple detector set, the author makes use of the constructive interest which the reader possesses and then leads him in an interesting manner through the mazes of alternating-current theory, the fundamentals of radio curcuits, and radio measurements. A series of questions at the end of each chapter assists the reader in organizing the subject matter in his mind and also forms a ready means of testing the knowledge which one has obtained from the chapter that has just been read.

Manual of Gilding and Compo Work

By C. A. Kunou. Cloth, 128 pages, 6⅞ by 10¼, illustrated. Price, $1.50. Published by The Bruce Publishing Company, Milwaukee, Wis.

This textbook will be welcomed by many industrial-arts teachers throughout the country. It is written by a man who can justly lay claim to the title "expert" in manual education, having spent the better part of his life in the teaching and supervising of this form of education.

The book is interestingly written. The historic background, the industrial applications, and the use in school is skillfully interwoven. The directions for doing the work are clearly given and many examples and problems, all of which are well illustrated, are given.

The question "How can this subject be taught in the small school, where funds are not easily obtained" has also been borne in mind by the author and his numerous suggestions of how to circumvent difficulties, and how to accomplish given ends in an inexpensive way will be welcomed by many instructors.

The ten chapters are devoted to: The use of gold in the arts; gold painting and gilding; compo and gesso work; gilding, ornamenting, and glazing on reed baskets; pictures and hand-mirror frames; book ends and novelties; lighting fixtures; home industry; cleaning and saving brushes; organizing and teaching the subject matter. Besides this, there is an appendix on specification of materials and equipment for gilding, compo, gesso, and polychrome work.

Fundamentals of Sewing

By Carrie Crane Ingalls. Cloth, 181 pages, 6 by 9¼, illustrated. Price, $1.60. Published by The Bruce Publishing Company, Milwaukee, Wis.

This textbook has been specially written for use in vocational and secondary schools. There are fifteen general assignments, which can be subdivided into as many lessons as the individual teacher may deem necessary. The subject matter is treated quite comprehensively and copious use has been made of well-executed line illustrations to help the student in visualizing each step.

The questions at the end of each chapter will be found helpful by student and instructor alike.

PERSONAL NEWS NOTES

Mr. H. O. Eiken who has been head of the vocational school at Antigo, Wis., has been elected director of the Green Bay, Wisconsin, Vocational School. Mr. Eiken is 35 years of age, and has been a member of the teaching profession for 15 years. He holds degrees from Stout Institute and the University of Wisconsin. He will have charge of both the day- and night-school work for the city of Green Bay.

Mr. Lloyd Jedeka, instructor in architectural drafting at the Boys' Technical High School, Milwaukee, Wis., is taking a course in pipe-organ playing at Chicago. Mr. Jedeka goes to Chicago once in two weeks, where he takes instruction under Mr. Al Carney, radio's greatest organist.

Mr. James F. Burba, formerly instructor in the Southern School of Printing, Nashville, Tenn., resigned on June 1, to enter the newspaper business in California. Mr. Burba had charge of the hand-composition, layout, and designing departments.

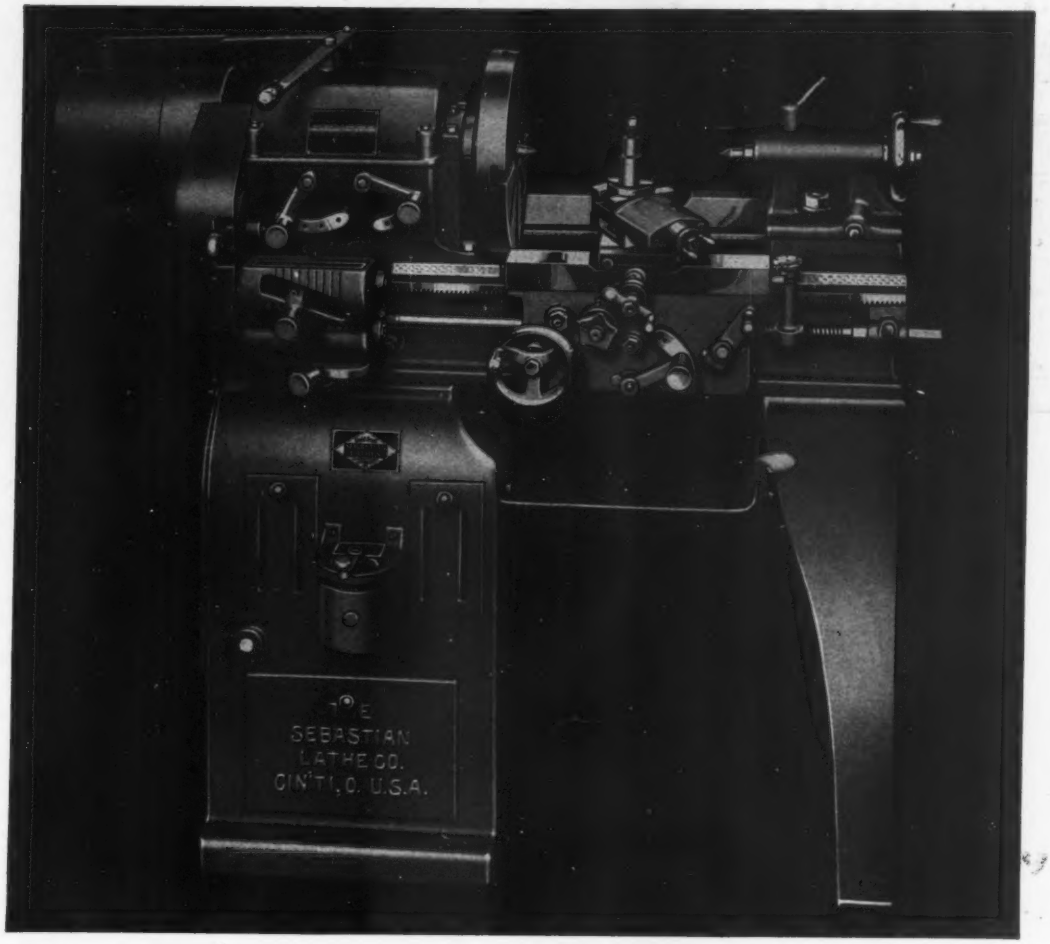
Mr. Burba is succeeded by Mr. C. M. Brosius, an old-time printer, who was at one time in charge of the journalism department of the John Brown College at Siloam Springs, Ark.

Mr. George C. Donson, supervisor of industrial arts at Washington, Pa., received his master's degree in vocational education at the University of Pittsburgh in June, last. Mr. Donson has been supervisor in the Washington schools since 1918.

Mr. Rollin Marsden, of Fullerton, Calif., recently visited his native state of Wisconsin. Mr. Marsden who organized the manual-

(Continued on Page 32a)

"a lathe without an alibi"



The Perfect Lathe For Schools

The needs of the manual training shop have been closely studied and as a result we have developed this 11" Gold Seal Heavy Duty Lathe.

Its distinguishable points are:—1. It is a small lathe with large lathe capacity.—2. It is oversized at every point.—3. It is absolutely safe.—4. It is practically unbreakable.—5. It is "sized" down to the student.—6. It is compact and not more "lathe" than you need.—7. It is the type lathe your Student will operate when he finishes School and gets into Industry.

The Sebastian Lathe Company

Cincinnati, Ohio.

Send the attached coupon for detailed information and specifications.

Coupon

The Sebastian Lathe Co., Cincinnati, Ohio.

Send descriptive Bulletin of your New 11-inch Lathe.

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The finest tool of its kind

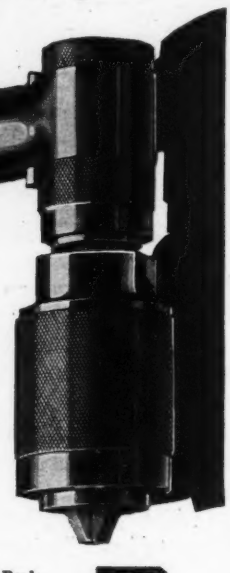
Guaranteed by the name "YANKEE"

Try This Test

With auger bit bore deep into tough wood. Then pull upward with all your strength. Bit will not come out of "Yankee" chuck.

See this "Yankee" Ratchet Bit Brace at your hardware dealer's. Made and finished like a precision tool. Try it and you will appreciate the economy of paying a little more to own the finest tool of its kind.

The famous "Yankee" Ratchet is smooth, powerful, silent—yet unbreakable. No need to hold chuck to keep it from turning back.



A finger touch gives right or left ratchet, or rigid. Positive visible adjustment. Dustproof. Moisture-proof.

NEW "Yankee" Chuck—most efficient ever made. Ball-bearing, quick centering, and accurate. Holds any bit (round, square, any taper) in vise-like grip. Yet chuck releases bit at turn of wrist.

Handles are hard rubber and indestructible. Top handle, steel clad, ball-bearing. Sweep handle caps held by patented "Yankee" method, preventing excessive handle play.

"Yankee" Ratchet Brace No. 2100
Price, 10" Sweep, $8.20

"YANKEE" on the tool you buy means utmost in quality, efficiency and durability.

Write for FREE "Yankee" Tool Book

Shows how "Yankee" Tools make work easier: Spiral Screw-drivers. Plain Screw-drivers. Automatic Push Drills. Ratchet Breast, Hand, Chain, and Bench Drills. Ratchet Tap Wrenches. Vises with removable base, etc.

North Bros. Mfg. Co., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

(Continued from Page 30a)

training department in the Webster School, Omro, Wis., left there in 1909 to become director of a similar department at Fullerton.

Dr. Edward Rynearson, formerly principal of the Fifth Avenue High School at Pittsburgh, Pa., has resigned and will hereafter devote his entire time to vocational-guidance work. Dr. Rynearson will give a course of lectures on vocational guidance at Cambridge University, England.

Mr. Robert Randolph Karch has been appointed head of the printing department of the Steubenville, Ohio, public schools.

Mr. Harvey G. Stewart, director of the vocational school at Green Bay, Wis., died recently at his home in that city. The board of vocational education adopted a resolution expressing regret over the passing of Mr. Stewart.

Mr. Walter Klehn has accepted a position as instructor of home mechanics and mechanical drawing at the Nebraska State Teachers' College, Kearney, Nebr., for the ensuing year. Mr. Klehn has just completed a graduate course at the University of Illinois. The subject of his thesis was "A Cost Accounting System for High-School Departments of Industrial Arts."

Miss Ruth Radford, formerly domestic-science instructor at Danville, Ind., is directing classes in vocational training in connection with the state's cooperative extension work in home economics.

Miss Josephine A. Marshall has been appointed professor of home economics at the Kansas State Teachers College, Pittsburg, Kans. **Miss Lulu Smith,** formerly associate professor of home economics at the College, has accepted a similar position at the University of Iowa.

Mr. Clemens Elected Head of Southern Printing School. At the annual meeting of the board of directors of the Southern School of Printing, Inc., held on May 14, at Nashville, Tenn., two directors, Mr. Frank C. Clemens of Houston, and Mr. R. A. Magill of Atlanta, were reelected for the next three years. The official staff will consist of the following:

President, Mr. Frank C. Clemens, Houston Tex.; vice-president, Mr. H. F. Ambrose, Nashville, Tenn.; secretary-treasurer, Mr. E. P. Mickel.

PUBLICATIONS RECEIVED

Workmen's Compensation Legislation in Relation to Vocational Rehabilitation. Bulletin No. 15 of the vocational rehabilitation series, and No. 126, December, 1927, of the Federal Board for Vocational Education, Washington, D. C. This pamphlet, which has been prepared by Mr. Frank J. Clayton, offers an analysis of certain provisions of the workmen's compensation laws showing their relation to the administration of vocational rehabilitation of disabled persons. It discusses particularly such topics as medical benefits, artificial appliances, compensation awards, and additional compensation for permanent total disability.

The Training of Foremen Conference Leaders. Bulletin No. 33 of the trade and industrial series, and Bulletin No. 125, December, 1927, of the Federal Board for Vocational Education, Washington, D. C. This pamphlet, which has been prepared under the direction of Mr. J. C. Wright, offers suggestions as to methods to be followed, and types of subject matter recommended by the committee of conference leaders. It discusses such topics as selection of trainees, working conditions, the carrying out of the conference phases, specific situations in operating conferences, and situations with which the conference leader has to deal. A series of fourteen charts are given to show the method of procedure in carrying out the work.

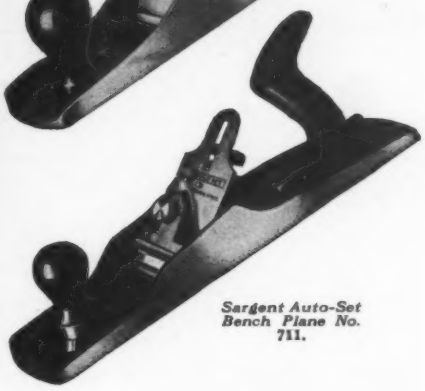
Unit Operations and Information Topics for Pressroom Apprentices. Prepared by Mr. H. A. Breucker, printing instructor, Holmes High School Junior Department, Covington, Ky. Paper, 21 pages. Published by the printing department at Covington, Ky. The present pamphlet has been issued as an aid to the young apprentice or student printer in performing certain fundamental operations that are adapted to any job in presswork. The unit operations and topics presented in the pamphlet should prove helpful in leading to a better understanding and a greater progress in presswork. The facts underlying the practice of the trade and the information necessary in planning a job are given so that the several units may be worked out successfully. A record form is inserted at the back of the pamphlet so that the student may mark the procedure of a job.

Unit Lessons in Sewing; Unit Lessons in Hand Composition; Unit Lessons in Home Economics. Loose-leaf booklets prepared by the instructors in these departments, under the direction of Mr. H. A. Breucker, printing instructor in the Holmes High School, Covington, Ky. The booklets are arranged in the form of unit operations in the different subjects and give the basic facts connected with learning the work offered in these subjects. The booklets represent typical jobs in printing carried out in the printing department of the school.

The Training of Teachers for Agriculture Evening-Class Work. Prepared by W. G. Crandall. Bulletin No. 129, April, 1928, of the Federal Board for Vocational Education, Washington,

(Continued on Page 35a)

Sargent Adjustable Iron Bench Plane No. 411.



Sargent Auto-Set Bench Plane No. 711.

Here's an edge that's easy to keep

THE Sargent Auto-Set plane has a tough, thin chromium steel cutter that will cut with, across, or against the grain of any wood. It is a tempered, hard cutter that will hold its edge unusually long. Instantly adjustable, either vertically or horizontally, by means of thumbscrew and lever, it is *set* at any position you leave it. This means that it can be removed, sharpened, and put back into the plane automatically at the exact position it held. Here, then, *is* an edge that's easy to keep. And here, too, is convenience for the classroom. No fussing and fumbling over readjustments—the cutter can be removed at any time—and when it is returned it will fall back into its former position, instantly ready for use.

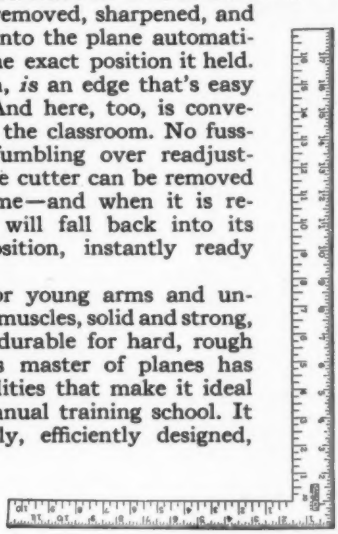
Light for young arms and undeveloped muscles, solid and strong, rigid and durable for hard, rough usage, this master of planes has many qualities that make it ideal for the manual training school. It is modernly, efficiently designed, and carefully built. Though pounds lighter than the ordinary plane, because the frog and clamp reach down to the very bottom, it is as solid as though bed, clamp and cutter had all been cast in one single unit. The cutter *can't* chatter, *can't* wobble . . . it is held too firmly.

There are other Sargent tools of value for classroom work. The old-style planes that Sargent makes, the best of their kind. Sargent squares, true, accurate, carefully scaled in a variety of useful tables, and supplied in many rust-proof finishes. The small steel block plane, that should be on every workbench. And Sargent clamps, with finely turned steel screws and heads and swivels of malleable iron. (For school use we especially recommend Nos. 13, 16 and 22, which open to 3, 6 and 12 inches.)

See these tools at your dealer's. Write to us for a catalog and further information. Sargent & Company, *Hardware Manufacturers*, 58 Water Street, New Haven, Conn.

Sargent Clamps Nos. 13, 16 and 22.

Sargent Steel Block Plane No. 5206.



Sargent Standard Steel Squares No. 30N, nickel plated. No. 30B, blued, white figures.

SARGENT
Tools & Hardware

Users of Drawing Inks: make some of these eight • tests at our expense •

Look for the dealer displaying this Pelican poster

EVERY user of drawing ink in the United States is invited to find out for himself, at our expense, that better drawings, finer blueprints, more attractive posters can be made with Pelican Waterproof Drawing Inks. If you are not already a Pelican user, go to your dealer and exchange the coupon for a bottle of Pelican Waterproof Drawing Ink. Then compare Pelican with the ink you are now using. Here are 8 ways:

Two Line Tests: Fill your ruling pen with Pelican drawing ink. Draw a wide line and you will note that Pelican ink does not run. Adjust your pen tightly. Draw a number of fine lines. Observe the easy-flowing quality, allowing the finest, unbroken lines till you have used the last drop in your pen. For Pelican ink won't dry in your pen.

The Drop Test: Let a drop of Pelican black drawing ink fall into a tumbler half filled with water. See how slowly it descends, cloudlike, without flaking or coagulating. It proves the cohesive quality of the minute particles which give such fine body to Pelican black drawing ink.

The Splash Test: With the real goose quill of the Pelican stopper, make a splash of Pelican colored drawing ink on an ordinary piece of drawing paper. Let it dry, and you will see that even a heavy splash will not run at the edges. You will have a proof of Pelican quality which will be more convincing than anything we could say in words.

The Waterproof Test: Make a drawing with Pelican Waterproof Drawing Ink, black or colored. Allow it to dry. Then color your drawing with water colors or give it a thorough wash. You will see that Pelican Drawing Inks are absolutely waterproof.

The Diluting Test: Dilute the intensely black Pelican ink with distilled or boiled water, or clean rainwater. See how the finely ground raw materials allow you to make the lightest shades of gray.

The Brush Test: Using a clean brush, make a few strokes with Pelican colored waterproof drawing ink on ordinary drawing paper or bristol board. Note how evenly and cleanly the brilliant shades can be applied. Above all, note the entire absence of pigment spots in the transparent surface. What a difference!

The Mixing Test: Mix Pelican white drawing ink with any one of the 18 brilliant Pelican colors. You can produce any desired number of rich, opaque shades that spread evenly over your drawing surface.

The colored stopper shows shade of Ink.

The Pelican Trademark Symbol of Quality Trademark

TO enable you to make some of these convincing tests at our expense, present this coupon to your dealer during the months of September and October, 1928. He is authorized to exchange it for a full-sized bottle of Pelican Waterproof Drawing Ink in black or white or one of the 18 brilliant shades.

Artists' materials and stationery stores, leading department stores and blueprint houses carry Pelican Waterproof Drawing Ink. If your own dealer does not yet stock Pelican, he can easily get it for you. Just show him the coupon.

Present to any dealer in the United States before October 31, 1928

25¢ TO USERS: On or before October 31, 1928, any retailer in the United States carrying Pelican Waterproof Drawing Inks is authorized to exchange this coupon, if signed by you, for a regular 25c bottle containing Pelican black or white drawing ink or one of the 18 brilliant Pelican shades. PELICAN WORKS GUNTHER WAGNER, 34 East 23rd Street, New York.

Name_____

Address_____

TO DEALERS: 25¢ On or before November 15, 1928, we agree to pay you for this coupon, if signed by you and the bearer, the full retail price of 25c for one full-sized bottle of Pelican Waterproof Drawing Ink, which we hereby authorize you to deliver to the person presenting this coupon. PELICAN WORKS GUNTHER WAGNER, 34 East 23rd Street, New York.

Name_____

Address_____

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(Continued from Page 32a)

D. C. This pamphlet represents a statement of experiences, working facilities, operative practice, and procedure relative to one phase of teacher training, and offers in detail a procedure in training prospective teachers of vocational agriculture for evening-class work. The importance of reaching the adult group through systematic instruction is indicated by the provisions of the national act and is generally recognized by those engaged in vocational education in agriculture.

The main portion of the bulletin deals with a detailed description of the training program; with cases indicating the effectiveness of the instruction in terms of practices changed on the part of farmers; with a statistical analysis and study of the results of the evening-class work done by 26 trainees; and with a brief summary of the principal features of procedure in training agricultural evening-class teachers.

Seasoning, Handling, and Care of Lumber. Prepared under the direction of Mr. A. H. Oxholm, director of the National Committee on Wood Utilization. Paper, 63 pages. Price, 15 cents. Issued by the U. S. Department of Commerce, Washington, D. C. The report represents the first of a series of bulletins on the seasoning and handling of lumber for the purpose of promoting the use of seasoned material. One of the important problems of the movement for improved wood utilization is the proper conditioning of wood through seasoning in order to increase its utility.

Forests and Floods. Circular No. 19, January, 1928, of the United States Department of Agriculture, Washington, D. C. Mr. Ward Shepard, forest inspector of the U. S. forest service, in this interesting pamphlet, discusses the forest as a soil and water holder, deforestation and erosion, soil wastage, grazing lands, farm lands, woodlands, river-bottom forests, forest-fire protection, and tree planting. Mr. Shepard points out that the prudent use of forest land, like the prudent use of farm and grazing land, pays its own way, and the gain to flood control is a by-product without cost.

Timber Growing and Logging Practice in the Lake States. By Raphael Zon. Bulletin No. 1496, February, 1928, of the United States Department of Agriculture, Washington, D. C. This bulletin of 63 pages discusses the forestry problem and outlines the measures necessary to keep forest land productive and to produce full-timber crops. The pamphlet takes up in detail such topics as first aid to reforestation, logging practice, forest taxation, the management of forest lands, and suggestions for handling forest lands.

Foremen Training in the United States. Prepared by Mr. Sven Stromgren, Stockholm, Sweden. Bulletin No. 131, June, 1928, of the Federal Board for Vocational Education, Washington, D. C. The pamphlet is a translation of a report by a Swedish engineer on foremen training in the United States. Mr. Stromgren spent six months studying foremen training in this country and in the course of his work, visited most of the points where important work has been organized in this field of training. The report which takes up technical training, organization, methods of training, and education of foremen should be of interest to communities and educators who are developing educational programs for industrial foremen.

NEW CATALOGS AND CHARTS

NEW CATALOG OF OLIVER JUNIOR WOODWORKING MACHINERY

The Oliver Machinery Company of Grand Rapids, Mich., has just issued a new catalog describing and illustrating the Oliver junior line of woodworking machines.

The catalog describes the Oliver portable line of woodworking machines, consisting of tilting-arbor saw bench, band-sawing machine, hollow-chisel mortiser, oilstone tool grinder, wood trimmer, disk sander, quick-acting clamps, electric glue pots and heaters, and electric babbitt pots.

The machines described in the catalog are all high grade and carry the same guarantee as the larger machines which have given the Oliver Company its reputation for quality.

School-shop instructors who are interested in portable woodworking machinery may obtain further information by writing to the Oliver Company at Grand Rapids, Mich.

NEW POST CATALOG OF DRAWING MATERIALS

The Frederick Post Company of Chicago, Illinois, has just issued its new catalog No. 15-A, illustrating and describing its line of drawing supplies and equipment for schools, manual-training departments, technical schools, and universities.

The catalog contains 156 pages devoted to drawing paper, cross-section paper, field books, drawing-pad outfits, drawing instruments, slide rules, pantographs, ruler and scale protractors, triangles, dividers, T squares, curves, drawing kits, drawing boards, drawing tables, drawing stands, filing cabinets, drawing inks, water colors, pencils, erasers, and pens.

The booklet also contains a layout of a typical school drafting room, as well as a list of suggested equipment for a school drawing class of twenty students.

Complete information and price lists for these materials may be obtained by writing to the Frederick Post Company at 319 South Wabash Ave., Chicago, Ill.

(Continued on Page 38a)

Six Day Classes
Two Night Classes

The Only Table
That Will Do the Job

Recently one of the new High Schools in one of America's greatest cities was in need of a Drawing Table that would accommodate six day classes and two night classes. They found this Kewaunee No. 205 was the only table available that would satisfactorily serve their purpose.

This Table provides private compartments for the equipment of eight students. As will be observed by the illustration, three perpendicular lockers open in the front, while three similar ones open in the rear. Each compartment will hold a 22 x 28 drawing board, a large set of instruments, scale, triangles, ink, detailed paper, etc., with a slot for a 24-inch T square. It puts everything of the student under individual lock and key except text books. Locks may be our standard master-keyed cabinet, or padlocks if desired.

These Tables are being installed in many schools to take the place of old drawing tables and wall cases. They eliminate confusion and increase efficiency.

This Table will meet all the requirements of the average high school or university.

We are manufacturers of a very complete line of Art and Mechanical Drawing Tables. Write for our complete Book of Illustrations.

See our SPECIFICATIONS in BRUCE'S SPECIFICATION ANNUAL INDUSTRIAL ARTS & VOCATIONAL EDUCATION EDITION

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS
ADRIAN FACTORY
C. G. CAMPBELL, Pres. and Gen. Mgr.
Drawing Room Furniture for Schools and Colleges
Designers and Manufacturers of Art and Mechanical
ADRIAN, MICHIGAN

Kewaunee

A Sheldon Bench for Every Purpose

Now that school is about to open you may require some additional benches or drawing tables. Sheldon builds benches for woodworking, auto mechanics, home mechanics, sheet metal shop, and electrical shop. Drawing tables are made to accommodate from one to eight classes. Write today for catalog and quotations.

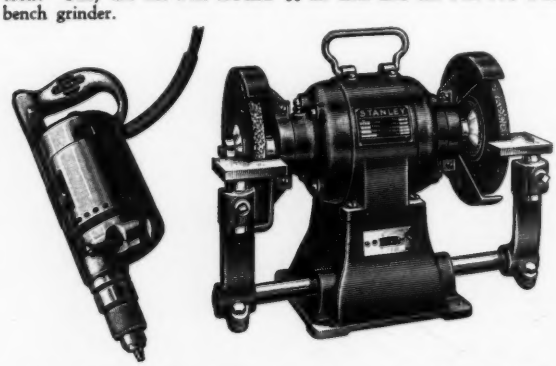
E. H. SHELDON & COMPANY, MUSKEGON, MICHIGAN
VOCATIONAL FURNITURE

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

STANLEY ANNOUNCES TWO ELECTRIC TOOLS

The Stanley Rule & Level Company of New Britain, Conn., has announced two new additions to the present line of electric tools. They are the No. DHLL $\frac{1}{4}$-in. drill and the No. 556 6-in. bench grinder.

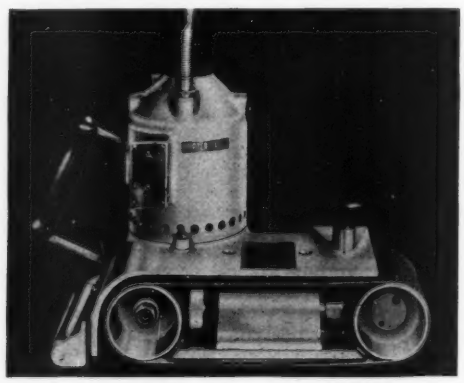


The $\frac{1}{4}$-in. drill combines all the attractive features of the Stanley electric drills. The straight, graceful lines are maintained and this combined with a powerful motor gives a light, powerful drill. A special ventilation system is maintained in these new drills, which allows continuous production work with minimum heat.

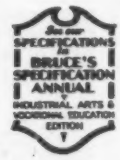
The bench grinder has been designed especially for sharpening small tools, as well as for general grinding work. It is furnished with two 6-in. grinder wheels (a coarse and a fine), wheel guards, adjustable toolrests, cable and switch. It is equipped for 110 or 220 volts A.C., and is provided with a handle for convenience in moving from one place to another.

NEW TAKE-ABOUT SANDER

The Porter-Cable Machine Co., Syracuse, N. Y., have placed a new Super Take-About Sander on the market which is built for heavy-duty work. It is equipped with a new type compound-wound, air-cooled, G. E. motor, of the universal type, which runs on either alternating or direct current of 25 to 60 cycles. The motor furnished with this sander will operate successfully on a 110-volt line which carries a 20-ampere fuse. The sander can also be furnished with motors for voltages from 32 up to and including 250 volts. The power is transmitted to the rear pulley by means of a worm and gear which are totally inclosed so that they are inaccessible to the dirt.



This Super Take-About Sander can be used, not only for sanding school-shop projects, but it can be used also for sanding entire floor areas, leaving a chatterless and waveless finish. The facility with which the sander works right up to the wall will be appreciated by woodworkers who have to do floor sanding. It can be used with equal facility for refinishing table tops, schools desks, and cabinets. The manufacturers of this sander guarantee to repair or replace all defective parts for a period of 90 days after purchase of the machine.



DIETZGEN

For nearly fifty years DIETZGEN instruments have served instructors of mechanical drawing and their students. Year after year DIETZGEN has fulfilled the various requirements, designing new and better sets to keep pace with progress. Small wonder that DIETZGEN instruments are so increasingly popular.

Write for condensed folder showing the more popular DIETZGEN SCHOOL SUPPLIES.

Every part is milled from cold-rolled nickel-silver; no cast metal is used in any DIETZGEN instrument. All parts are listed in our catalog for your convenience.

All DIETZGEN instruments are made in our own factory and are thoroughly *standardized*, the parts in each grade being interchangeable. This exclusive feature is extremely important to instructors. Lost or worn parts can be ordered by number from our catalog or replaced from our Repair Outfit

EUGENE DIETZGEN CO.

Enduring worth at reasonable cost

Chicago New York New Orleans Pittsburgh San Francisco

DIETZGEN ESTABLISHED 1848

Philadelphia Washington Milwaukee Los Angeles *Factory at Chicago*

Manufacturers of Drafting and Surveying Supplies

School Supervisors Praise C & P Presses

CHANDLER & PRICE Presses are standard equipment in the printing departments of schools all over the United States. Pleasant comments like these below show that C & P Presses are doing their work well:

"Upkeep negligible."

"Ordinary upkeep is very small."

"C & P Presses perform beyond expectations."

"Several of our students are employed as pressmen in the trade."

"They certainly stand lots of abuse from our would-be pressmen."

"C & P Presses stand the knocks of inexperienced beginners in a fine way."

"Running, maintenance and upkeep cost less than one per cent omitting power lost."

"The running cost is very low for power, and the upkeep very reasonable under school conditions."

"C & P Presses stand up excellently. They do about everything that can be expected of a press. They lead."

Chandler & Price
PRESSES & PAPER CUTTERS

THE CHANDLER & PRICE COMPANY

Cleveland, Ohio, U. S. A.

(Continued from Page 35a)

NEW CATALOG OF HESTON-ANDERSON WOODWORKING EQUIPMENT

The Heston & Anderson Company of Fairfield, Iowa, has issued a new catalog of 31 pages, illustrating and describing the various bench woodworking machines manufactured by the firm for school-shop use.

The catalog lists electric band saws, electric saw tables, saw guards, swinging cut-off saws, electric bench jointers, bench lathes, lathes, scroll saws, spindle shapers, glue pots, chisels, and wood lathe accessories.

NEW CATALOG AVAILABLE

The Phillip Gross Hardware & Supply Co., 216-220 Third St., Milwaukee, Wis., has just issued a new catalog on machine-shop and carpenters' tools and supplies for manual-training school needs. The catalog lists about 5,000 items that can be used in schools. A copy can be obtained by writing for it, mentioning school and the teaching position held therein.

STANLEY OFFERS CHARTS TO WOODWORKING INSTRUCTORS

The Stanley Rule & Level Company of New Britain, Conn., is offering six new school charts free to instructors of woodworking. The charts measure 14 by 18 in., and are printed on heavy white bond paper. When mounted on cardboard and framed under glass, they serve as a constant source of information to the boys in the woodworking classes.

The Stanley Company also offers this series of charts in notebook size, 8 by 10½ in., printed on tracing paper so that they may be blue-printed for use in the boys' notebooks.

The Stanley charts previously issued are still available.

Test Sheet in Proofreading for Printing Instructors. Barnhart Brothers & Spindler of Chicago, Ill., have announced a test sheet in proofreading for the use of printing instructors in school printshops.

The material is arranged on a card and gives all the information about the various marks and characters used in printing. It shows the proofreaders' marks, how to mark errors, and other expert advice helpful to those working at the trade.

NEWS AND NOTES

Install Electrical and Sheet-Metal Shops in Vocational School. The St. Louis board of education has authorized the installation of equipment for the electrical and sheet-metal shops recently established in the Vocational School. This school was established in December, 1926, for the training of children forced to leave school and go to work at an early date. It is planned to develop the facilities of the school as demands increase with the growth of the school.

Electrical Department of Newark Vocational School Remodeled. The electrical department of the Essex county vocational school at Newark, N. J., has been remodeled to conform to a new plan of operation which will go into effect. Space has been provided in the shop for the laboratory work which was formerly conducted as a part of the related classwork. The work in motor wiring has been transferred to the section formerly used for testing. The wiring end of the shop has been entirely rebuilt along new lines, giving increased opportunity for certain types of work.

Sheet-Metal Class Construct Waste Cans. The sheet-metal class of the Essex county vocational school, Newark, N. J., recently constructed waste cans for the various shops of the vocational school. They also made articles of use for the other shops, such as pails for the tile-setting class, pans for holding oil drips from automobiles, and skylights for the new building-trades school.

Establish Radio Course at Newark Vocational School. A radio course has been established at the Essex county vocational school at Newark, N. J. The course has been developed in cooperation with service men and engineers in the radio manufacturing, wholesale, and retail field and covers the essential principles necessary for training boys for radio upkeep service.

Establish Part-Time Industrial Course at Pottstown. A part-time industrial cooperative course has been established at Pottstown, Pa., under the direction of Mr. W. O. Cressman, director of vocational education. The work has been inaugurated with the cooperation of the local industries who have agreed to use as many boys as can be accommodated in the shops.

Foreman Training in Philadelphia. A program of foreman training has been established at Philadelphia, Pa., through the cooperation of the state education department, the Federal Board for Vocational Education, and the local metal manufacturers' association. The program which was in charge of Mr. G. A. McGarvey, agent of the industrial education service of the Federal Board for Vocational Education, involved such features as the informing and recruiting stage, observation and demonstration conferences, foreman conference groups, follow-up and improvement.

Establish Vocational Courses in Waltham High School. The school board of Waltham, Mass., has approved a recommendation of the superintendent of schools, providing for the establishment

(Continued on Page 41a)

(Continued from Page 38a)

of vocational courses in printing, machine-shop practice, cabinetmaking, and auto mechanics. Under the plan, the courses will be conducted as Smith-Hughes work and boys will be trained for trade and industrial life.

Madison Conducts Course of Instruction for Policemen. A course of instruction for police officers has been inaugurated at Madison, Wis., in connection with the local vocational school. The course which is compulsory for all fire and police officers, was organized by the Madison Vocational school and has the approval of the fire and police commission.

The course is organized along the lines of the lecture method, and the instructor conducts the reviews and discussions, which follow the lecture in each particular subject. The school has been a decided success and has the approval of the officers as well as the commission. Among the subjects covered in the course are preparation for patrol, first aid to the injured, court procedure and common law, psychology and mental hygiene, and city ordinances.

Lindblom High School Receives Gift of Electric Motor. The Lindblom High School, at Chicago, Ill., recently received a gift of a large electric motor from the Crane Company. The motor is extremely large, has a 20-h.p. capacity, and requires 70 amperes at 230 volts for operation. The presentation of the gift is interesting at this time in view of the fact that Mr. R. F. Crane, the founder of the Crane Company, was known as a pioneer sponsor for the technical training of boys of school age.

Announce Motion-Picture Film of Agricultural Outlook. The U. S. Department of Agriculture has announced a new two-reel film of the Annual Agricultural Outlook, entitled "What's Ahead?" This film from the bureau of agricultural economics, shows how the agents of the department gather, assemble, and boil down facts for the annual "Outlook" published by the department. Copies of the film are available for the mere cost of transportation.

Forest Bureau of U. S. Department of Commerce Lays Down Principles for Perpetuation of the National Forests. The National Committee on Wood Utilization, in a recent communication, pointed out that there exists some confusion in the public mind, as between preserving certain forest parks as monuments of beauty and conserving natural resources for utilization and national service, and in this direction it has attempted to serve the public by clearing away much of this confusion.

In an attempt to meet the situation, the committee addressed a letter to Col. W. B. Greeley of the Forestry Bureau, asking him to give his views as to the means which might be used for solving the forestry problem. In his reply, Col. Greeley points out that timber crops must be harvested when mature in order to prevent a partial or total loss; closer utilization of timber will make forest crops more valuable and will encourage their production; responsibility is with the forest industries and landowners for extension of timber growing as part of their operations; timber culture should be speeded up in order to avoid the danger of large areas of land left unproductive by destructive logging and fires; and again, right use of timber has a tendency to perpetuate the supply where aggressive refocestation and closer use of raw materials are practiced.

Complete Trade-School Addition at Newark. The classes in carpentry and bricklaying recently completed an addition for the Essex County Trades School at Newark, N. J. In the work, steel girders, weighing 550 pounds were lifted and placed by the boys. The work was well done and successfully carried out under the direction of the instructors.

Machine Shop of Albany Vocational School Operates on Production Basis. The machine shop of the Boys' Vocational School, Albany, N. Y., working on a production basis, has turned out 100 center punches, 50 lathe centers, 50 toolmakers' clamps, and 50 planer bolts. Under the production method, the department has demonstrated that it can turn out more than by individual parts. The educational value in this method is also greater than under the individual project method. In the case of the student, it is noted that he is able to accomplish more, and is also better able to practice and retain the knowledge gained by a repetition of operations. Another advantage is that it is more economical from the standpoint of production.

Hold Pennsylvania Vocational Conference at Eagles Mere Park. The annual state vocational conference of Pennsylvania was held June 28 to 30, at Eagles Mere Park, Pa., with an attendance of more than 500 teachers, supervisors, and directors of vocational education.

At the session on continuation-school work, Dr. R. L. Cooley of Milwaukee, Wis., talked on "The Milwaukee Part-Time School," and Mrs. Camilla Morgan of Kingston discussed "The securing of Favorable Recognition for the Part-Time School." Mr. H. K. Balsbaugh of Harrisbury talked on "The Continuation-School General Shop."

At the industrial-education section, the discussions centered around the topic, "A Vocational Industrial-Training Program," with Mr. Frank Leavitt, Mr. E. S. Sparks, Mr. J. C. Wright, and Mr. H. R. Vanderslice as the leaders. Mr. G. H. Parkes of Williamsport, dis-

(Continued on Page 42a)

Hyatt Bearing in Fly-wheel

Two Sizes 30½ and 34½ In.

DIAMOND Power Cutters

are Rapid, Powerful, Durable, Accurate, Convenient, Safe and Most Attractive

Diamond Cutters are also made as Lever Cutters to which Power Fixtures can be easily attached

Send for full information regarding Diamond Cutters and for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Advance Lever Paper Cutters
Lee Two-Revolution Cylinder Press
Hoerner Combination Type-High Machine
Challenge Addressing Machine
Mercantile Addressing Machine
Sieber Adjustable Hand Punch
Challenge Proof Presses
McGreal Combination Printers' Chases
Challenge Labor-Saving Iron Furniture
Challenge Mammoth Iron Furniture
Challenge Notched Iron Furniture
Challenge Semi-Steel Imposing Surfaces
Challenge Pressed Steel Galleys
Challenge Rigid Rim Galleys
Challenge Iron Sectional Blocks and Hooks
Challenge Type-High Gauges
Challenge Quoins and Keys

The Challenge Machinery Co.

GRAND HAVEN, MICHIGAN

Chicago, 17-19 E. Austin Ave. New York, 200 Hudson St.

A COMPLETE LABORATORY UNIT!

Ideal for Physics and Vocational Departments of Public, Private and Special Schools

THE HANDY ELECTRO LAB FOR SCHOOLS

Saves You Money on Equipment!

A COMPLETE, compact and serviceable unit for schools. Contains all materials and equipment needed by student in first physics course. A well known electrical engineer, in collaboration with a trade school instructor, designed the Handy Lab and wrote the Instruction Book specially for school laboratory work. Its sixty experiments correspond to those of standard textbooks in physics. And besides, many more experiments and hook-ups are possible with this complete lab set.

Write Now for Bulletin!

THE HANDY ELECTRO LAB CONTAINS—

- 1 Coil German Silver Wire
- 1 Bottle Iron Filings
- 1 Bottle Tacks
- 1 Bottle Miscellaneous Nails
- 1 Bottle Sal Ammoniac
- 1 Piece Brass Wire
- 1 Aluminum Rod
- 1 Piece Glass
- 1 Slate Rod
- 1 Piece Fibre
- 2 Pieces Steel Wire, 16 Gauge
- 1 Glass Test Tube
- 1 Coil Iron Wire, No. 24, B. and S. Gauge
- 1 Coil Nichrome Wire, No. 24, B. and S. Gauge
- 1 Pith Ball and Stand
- 1 Special Glass Rod
- 1 Coil Bell Wire
- 1 Large Darning Needle
- 1 Lead Plate
- 1 Porcelain Knife Switch
- 1 Zinc Plate, Fahnesstock Clip
- 1 Piece Carbon Rod with Fahnesstock Clip
- 1 Fine Steel Bar Magnet
- 2 Compass Needles
- 2 Compass Needle Stands
- 1 Heavy Horseshoe Magnet and Keeper
- 1 Pocket Compass
- 1 Fan Blade and Guard
- 1 Hard Rubber Rod
- 1 Spool No. 27 C. C. Wire
- 1 Spool No. 24 C. C. Wire
- 1 Electromagnet
- 2 Miniature Porcelain Sockets
- 2 Miniature Lamps
- 1 Telegraph Key
- 1 Telegraph Sounder
- 1 Galvanometer
- 1 Ammeter on Terminal Board
- 1 Voltmeter on Terminal Board
- 1 Generator and Pulley
- 1 110 volt-60 cycle Motor and Pulley
- 1 Metal Chest and Tray (Red Crackle Duco)
- 1 Book of Instructions

Write for Full Details of This Lab!

Public, private and special schools can obtain full information about the Handy Electro Lab by writing to—

INTERSTATE ELECTRIC CO.

4340 Duncan Avenue • • • St. Louis, Mo.

[Agents! *Write or wire for our sales plan. Some choice territories still available.*]

(Continued from Page 41a)

cussed "The Making of Contacts with Industry," and Mr. C. E. Hedden of Harrisburg, talked on "The Place of the Day-Unit Trade Course in an Industrial Program."

At the industrial-art section, Mr. Wm. J. Brown of Forty Fort, talked on "Shop Management in the General Shop"; Mr. W. E. Steiner of Sunbury, discussed "The Foundry Unit"; and Mr. S. L. Coover of Beaver Falls, talked on "General Shop Projects."

There were a number of sectional meetings in which the subjects of electricity, metal work, plumbing, printing, woodworking, and related subjects were taken up by various leaders.

American Vocational Association Legislative Committee Holds Meeting. The legislative committee of the American Vocational Association held a meeting on June 27, at Eagles Mere Park, Pa., preceding the state vocational conference. Among the persons in attendance at the meeting were Dr. R. L. Cooley of Milwaukee, Wis.; Mr. L. H. Dennis of Harrisburg; Mr. C. M. Miller of Topeka, Kans.; Mr. Ray Fife, Columbus, Ohio; Mr. P. W. Chapman of Atlanta, Ga.; Mr. R. W. Heim of Delaware; Mr. P. L. Cressman of Harrisburg, Pa.; Mrs. Anna G. Green and Mr. H. C. Fetterolf of Harrisburg.

The committee had a full day's session during which plans were outlined for promoting the national vocational legislation program between now and December 1.

Announce Civil Service Examination. The United States Civil Service Commission has announced an open competitive examination for a teacher of agriculture (dry-land farming) and a teacher of agriculture (irrigation).

The examinations are to fill vacancies in junior and senior high schools in the Indian field service and the entrance salaries range from $2,000 to $2,300 a year.

Full information concerning the examination may be obtained from the Civil Service Commission at Washington, D. C., or from the secretary of the Civil Service Board of Examiners at the post office or customhouse in any city.

Philippine Civil Service Examination. The U. S. Civil Service Commission has announced an open competitive examination for a specialist in agricultural and rural education, one in reconstruction of school curricula, one in elementary education, and one in teacher training for Philippine service.

The examinations are to fill vacancies in the Philippine Islands and the entrance salaries range from 6,000 to 8,000 pesos a year. Competitors will be rated upon their physical ability, education, training, and experience.

Complete information concerning the examinations may be obtained from the U. S. Civil Service Commission, Washington, D. C., or from the secretary of the civil service board of examiners in any post office or customhouse.

New Junior-High-School Shops at Washington, Pa. The new junior-high-school building at Washington, Pa., provides space for a number of shoprooms. A general metal shop for machine-shop, forging, sheet-metal, and auto-mechanics work has been provided, as well as a woodworking shop for bench and cabinetwork and wood turning. A drafting room for fifty students will also be included. The building will be ready for use in September, 1930.

Manual-Education Clubs in Los Angeles. A definite effort to introduce handwork in the home has been made by the department of manual education of Los Angeles, Calif., through manual-education clubs in the schools. A successful club has been maintained at the Pacoima School for a year.

Under the plan, the clubs seek to encourage the making of articles of use and beauty for the home, as well as salable products which may add to the family income. Boys are helped to acquire simple equipment in handcraft for themselves and their parents, and the teachers are giving extra time to assist the pupils in the work. The plan is in line with a movement for home and adult education.

Silver Cup Awarded to Vocational Schools. A silver cup, made by the boys of the Connecticut State Trade School at Meriden, Conn., for the Wallpaper Manufacturers' Association, has been presented to the vocational schools of Fond du Lac, Madison, and Racine. The cup will be retained by each of the schools for three months, and the circuit tour will be repeated each school year.

A fund for the promotion of better craftsmanship in the decorating trades was established with the aid and cooperation of Mr. E. K. Jenkins, director of the vocational education for the guild of paper manufacturers, and eleven other teachers of painting and decorating, each of whom wrote an article devoted to the interests of the trade. The money received for the papers, amounting to $25 in each case, was used to buy the material which went into the construction of twelve silver cups.

The boys of the Meriden school made the cups from a design produced by the instructor in metal spinning. All of the work, including the silver plating and gold plating, the finishing and burnishing, was done by the boys of the school. The engraving and lacquering work was donated by a silver manufacturing firm.

(Continued on page 44a)

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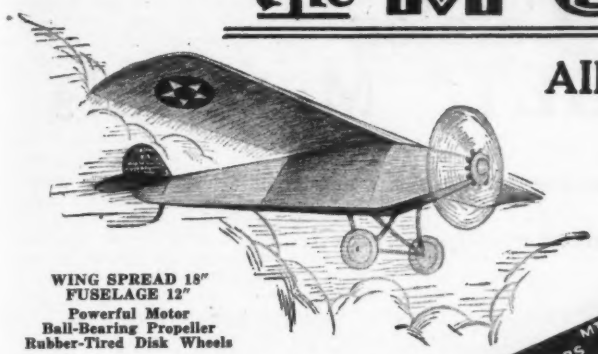

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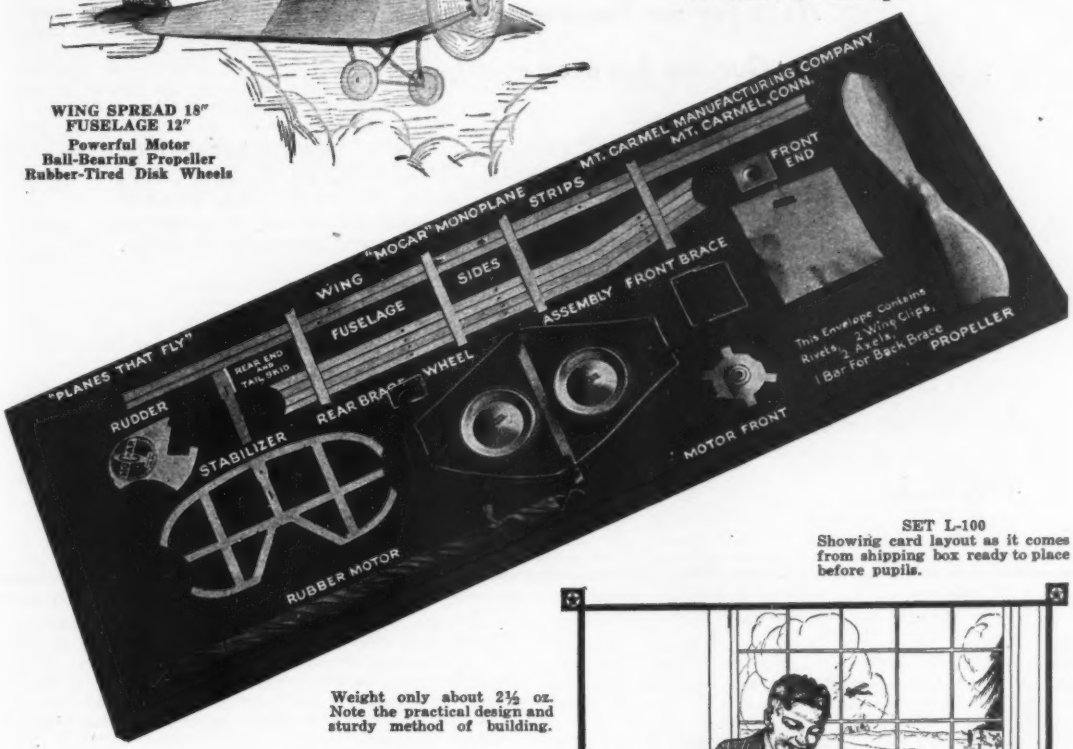

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(Continued from Page 42a)

New Plan of Vocational Guidance. Wisconsin educators, through a special committee representing the secondary schools, colleges, universities, and normal schools of the state have endeavored to find new ways of assuring each student in high school or college the training for which he is best fitted.

The committee has decided to compile literature to be sent to each high-school graduate and to his parents giving in nontechnical language the best conclusions on the effects of past educational achievement, and individual personality upon success in college work. The committee has begun work upon a new type of college-entrance blank. The new form is available to each institution of higher learning in the state and gives the regular credits, as well as personality ratings, and data on the interests and aptitudes of students.

Another development is the compilation of a cumulative record system extending from the kindergarten through the high school. This record system traces the educational growth of the student and notes the elements of the pupil's personality. It will form the basis for more effective educational guidance.

Academic Viewpoint Peril to Vocational Education. Standards of the academic school organization and the point of view of the general educator are threatening the efficiency of the nation's vocational-education program, according to the Federal Board of Vocational Education.

The Federal board points out that should the time ever come when vocational programs are conducted by individuals who have been selected on the basis of their academic degrees rather than on the basis of the mastery of their occupations, vocational education under the national vocational law will become inefficient and will fail to render the social service which Congress and the framers of the law intended should be rendered.

At the present time the programs which are being carried on in cooperation between the Federal board and the states are beginning to enter upon the later stage. The question of the establishment of standards and the means whereby these standards may be used to measure the efficiency of work in vocational education is now beginning to receive serious attention from both the Federal board and from a number of state officers.

It is the belief of the Federal board that a responsibility exists for seeing to it that Federal funds are used for the encouragement and development of vocational education programs which give the largest return for a dollar expended.

A tendency which the board views with a great deal of approval is that of establishing programs in vocational education, in cooperation with representatives of the occupation with whom those courses deal. During the year there has been a marked increase in the country calling for cooperative groups in the setting up of cooperative relations, and for the development of efficient part-time programs which may be used and conducted.

Another tendency of which the board approves is that of making more adequate provision for those who are employed, whether youth or adult. This tendency has been very marked in certain states. At the present time, more funds, time and attention are being given to the education of apprentices, young employed workers through continuation schools, and for adults already employed.

The Encouragement of Picture Appreciation. During the last few years there has been an awakening of interest in good pictures, and one of the reasons given for this interest is the promotional work carried on by the American Art Bureau League of Chicago, Ill.

The American Art Bureau League has adopted a policy of continuous, progressive promotion of art appreciation. The annual report of the Bureau, recently issued, indicates the enormous increase in the purchase of good pictures and the increased interest and attention which is being given to the subject. The work of the Bureau is indorsed by the great museums of the country, by schools, and art authorities.

The Bureau has issued a booklet entitled "Pictures in Your Home," which gives pertinent suggestions for the proper furnishing of a home, with due regard to walls, furniture, pictures, and mirrors.

Vocational Guidance Proposed at Great Falls. Guidance of pupils in the selection of vocations has been proposed at Great Falls, Mont. The proposal followed an address by Mr. I. W. Smith, of the local high school, who said that one of the great local needs is the direction of the pupils along proper vocational lines.

Vocational School at Sudbury, Mass. A free trade school for boys will be opened in the near future at Sudbury, Mass., under the patronage of Mr. Henry Ford of Detroit, Mich.

The trade school will be modeled on the plan of the vocational school at Detroit, but will take the form of a boarding school housing 30 students. The school will not be limited to boys of a mechanical bent, but will offer a certain amount of broad study. The courses offered will include farming, hotel and dairy management, baking, buying and selling, and other vocational courses. Students between 14 and 20 years of age are eligible to enter the school.

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Closing Exercises at the David Ranken School. The David Ranken, Jr. School of Mechanical Trades, St. Louis, Mo., held its 19th annual closing exercises on Monday evening, July 9. In the 2-year trade courses there were 7 graduates from the carpentry class, 9 from the plumbing, 1 from the painting, 6 from the pattern-making, 6 from the machine shop, 12 from the automobile-repair shop, 27 from the electrical course, 1 from the power-plant course, and 3 metal-trades apprentices.

From the 5-year evening-school courses there were 1 plumber, 1 electrician, 1 architectural draftsman, and 1 mechanical draftsman graduating.

Progress of the Educational Work of New York Printers' Association. Splendid progress has been made by the New York Employing Printers' Association along educational lines, a fact which was emphasized recently when nearly 200 students took part in the annual graduation exercises. The enthusiasm of the students and the fact that so many persons engaged in the printing business are willing to give their time toward improvement, is a most encouraging sign. Mr. I. H. Blanchard, chairman of the educational committee of New York, is largely responsible for the results in the metropolis and is deserving of the utmost credit for the accomplishments.

Southern School of Printing Extends its Influence Over 28 States. The increasing influence of the Southern School of Printing at Nashville, Tenn., is indicated by the number of graduates in the different states. Organized a little more than eight years ago, the school has already turned out six hundred graduates, almost all of whom have taken positions in the printing trade. These students have gone to almost every state in the northwest and the Mississippi valley.

Illinois and Michigan, with their great printing centers in Chicago and Detroit, have more than 25 graduates of the school. Pennsylvania, Ohio, Indiana, Iowa, and Missouri each have more than ten graduates apiece working within their borders. New York and Minnesota have more than five apiece, while California and Iowa have several students who completed courses at the school.

Central Printing School in New York Needed. Mr. F. A. Silcox, industrial-relations director of the New York Printers' Association, speaking recently before the Printing Crafts Club in that city, reiterated the need for a $2,500,000 centralized school for training apprentices. He pointed out that New York is the only city in the country with a combination plan of board of education, organized labor, employers, and craftsmen.

Federal Board for Vocational Education Publishes Educational Material for State Vocational Courses. The Federal Board for Vocational Education, in a series of articles, is presenting the practical contacts of the various bureaus and divisions of the governmental service. Groups of articles have been published under such topics as education, taxation, transportation, trade practices, the arts, agriculture, industry, and mining. The latest article, No. 28, deals with publications and records for the educational service. It shows that the board publishes from time to time the results of studies and researches conducted by members of the staff. The board maintains no research division but considerable work is done with the aid of 24 specialists of the staff. Since 1917 the Federal Board has issued 124 bulletins on vocational education and civilian rehabilitation. All of the publications are distributed free to the extent that the editions permit. Many of the publications may be purchased for a nominal price from the superintendent of documents.

Wisconsin Profits From Farm Training in Schools. Dr. C. H. Lane, chief of the agricultural-education service of the Federal Board for Vocational Education, in a recent report, shows that Wisconsin has found its program of vocational agricultural education profitable. According to Dr. Lane, the total net income from supervised home projects, conducted through the public-school systems, was $91,173 in the past year.

Dr. Lane shows that in 71 communities of the state, vocational agricultural education is an integral part of the public schools. Wisconsin has attempted to solve the problem of the student who leaves school early in the year, by offering part-time courses for particular subjects, and has aided the adult farmer by establishing evening schools.

In these 71 communities of the state, the agricultural departments employ a vocational teacher for twelve months; all of them maintain a four-year agricultural course, and there has been an increase of over 83 per cent of these departments in the last ten years.

In a study made in the fall of 1926, a study was made of 150 freshmen in the Wisconsin College of Agriculture. It was found that 52 per cent of these had taken agriculture in the high school and that 47 per cent had had two or more years of it. There were 24 per cent who had had four years of high-school agriculture.

Vocational agriculture has deferred values, but its immediate returns are gratifying. As a result of the pupil's successful farm practice, it is expected that there will be definite improvement in practices on the home farm in succeeding years.

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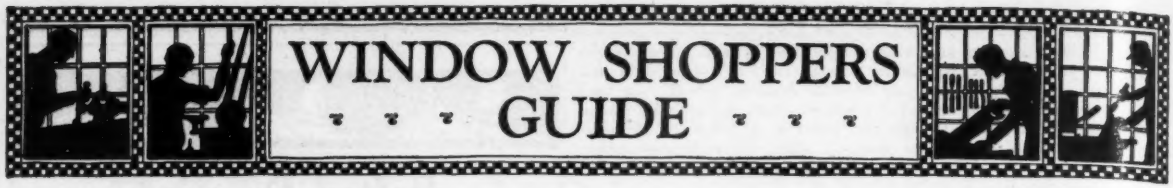

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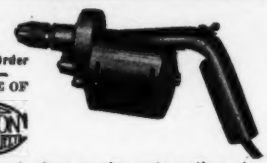

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